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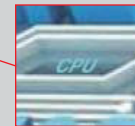
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Monthly last-page interview with people who help to shape the PC industry.

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Corsair's New RM Series PSUs

Corsair has introduced the RM Series of power supplies, a new line of PSUs designed at the component level to be exceptionally quiet during operation. The PSUs incorporate low-noise transformers and capacitors and include a Zero RPM Fan Mode that ensures their fans only spin when the units are operating under a heavy load. Models in the RM Series range from 450- to 1000-watt power capacities and are all 80 PLUS Gold-rated. The RM1000 model comes with a Corsair Digital Bridge cable (optional with other models) that can be linked to motherboards or Corsair Link hubs to monitor fan speeds and power delivery in real time using Corsair Link software. All RM models are fully modular and come with low-profile black cables, but optional cable colors are available to fit system builds with specific color schemes. Corsair says the RM Series of PSUs will replace the older TX Series and that the new models are compatible with Intel's latest Ivy Bridge-E and Haswell processors. Prices range from \$99.99 to \$199.99.

GIGABYTE Expands BRIX Line

GIGABYTE recently announced it was updating its BRIX line of ultra-compact PC kits, with several products in the line sporting the latest 4th Generation Intel Core processors. Four new BRIX kits will be available with CPUs ranging from an Intel Celeron 2955U to a Core i7-4500U. BRIX units are barebones kits for do-it-yourself PC builders who want the ease of a kit build but with some flexibility when it comes to added features. The kits ship with processors, motherboards, PSUs, Wi-Fi 802.11 b/g/n and Bluetooth 4.0 modules, mSATA connectors, and all the necessary cabling, all wrapped up in a sleek black case that will be at home pretty much anywhere. All you need to do is add the system memory and an SSD and you're ready to go.



WATCHING THE CHIPS FALL

Here is the pricing information for various AMD and Intel CPUs.

CPU	Released	Original Price	Last Month's Price	Online Retail Price*
AMD FX-9590 Eight-Core	6/11/2013	NA	\$849.99	\$699.99
AMD FX-9370 Eight-Core	6/11/2013	\$375	\$349.99	\$299.99
AMD FX-8350 Eight-Core	10/23/2012	\$195	\$199.99	\$199.99
AMD FX-8320 Eight-Core	10/23/2012	\$169	\$159.99	\$159.99
AMD FX-8150 Black Edition Eight-Core	10/12/2011	\$245**	\$169.99	\$169.99
AMD A10-6700 Quad-Core	6/4/2013	\$142**	\$148.99	\$148.99
AMD A10-6800K Quad-Core	6/4/2013	\$142**	\$149.99	\$149.99
AMD A8-6600K Quad-Core	6/4/2013	\$112**	\$119.99	\$109.99
AMD A8-6500 Quad-Core	6/4/2013	\$112**	\$118.99	\$118.99
AMD A10-5800K Quad-Core	10/12/2012	\$122**	\$129.99	\$129.99
Intel Core i7-4960X Extreme Edition	9/3/2013	\$990**	n/a	\$1,049.99
Intel Core i7-3970X Extreme Edition	11/12/2012	\$999**	\$1,019.99	\$1,039.99
Intel Core i7-4770K	6/2/2013	\$339**	\$339.99	\$339.99
Intel Core i7-4770	6/2/2013	\$303**	\$294.99	\$309.99
Intel Core i7-3820	2/12/2012	\$305**	\$299.99	\$299.99
Intel Core i5-4670K	6/2/2013	\$242**	\$239.99	\$239.99
Intel Core i5-4670	6/2/2013	\$213**	\$219.99	\$219.99
Intel Core i5-4570	6/2/2013	\$192**	\$199.99	\$199.99
Intel Core i5-4430	6/2/2013	\$182**	\$189.99	\$189.99
Intel Core i3-2130	9/4/2011	\$138**	\$129.99	\$129.99

* As of October 2013

** Manufacturer's estimated price per 1,000



More Tablet News From ASUS

ASUS has been expanding its tablet offerings lately and now has a 10.1-inch model with a full HD screen (1,920 x 1,200). The MeMO Pad FHD 10 sports an Atom Z2560 (1MB cache, 1.60GHz, Clover Trail), 2GB memory, dual cameras (1.2MP front with 720p record; 5MP rear with 1080p record), and a choice of 16GB or 32GB of storage. Dual speakers with ASUS SonicMaster technology ensure the audio playback will complement the HD video. You won't get cut off mid-movie, either, as battery life is estimated at 10 hours. The tablet is Miracast-enabled for better video streaming, and it comes with Micro USB and Micro HDMI jacks, a 2-in-1 audio jack, and a microSD card reader. Weighing in at just 1.27 pounds, the MeMO Pad FHD 10 comes with the usual assortment of ASUS software (ASUS Launcher, ASUS Studio, etc.) and runs on Android 4.2 (Jelly Bean). Prices start around \$329 for the 16GB version.

ECOVACS Does Windows

Washing windows may rank in the neighborhood of cleaning the cat box when it comes to how much fun various household chores are, but that may change thanks to the Winbot from ECOVACS Robotics. The company calls the Winbot the "world's first successful window-cleaning robot," and says you simply switch the Winbot on, place it on a window or mirror, and press Start, and then let the machine do the rest. The Winbot creates a vacuum to attach itself to the glass surface (a safety tether is included for above-ground windows), and then the robot uses sensors to map out the size of your window. It calculates the optimal cleaning path and then sets about traveling along the window, cleaning as it goes. ECOVACS says the cleaning pads on the robot can be quickly removed and dropped in a washing machine for easy maintenance, and the device comes with extra cleaning pads, cleaning solution, and other accessories. Winbot is available for about \$400 at www.winbot7.com.



EVGA Branches Out Into Chassis

If you're thinking about Mini-ITX for your next build, you'll want to check out the new Hadron Air chassis (\$189.99) available from EVGA. At 12 x 6.6 x 12.1 inches (HxWxD), the Hadron Air chassis is extremely compact, but offers a number of enthusiast features. The sleek-looking case comes with a Gold-rated 500W PSU (40A on its +12V Rail) and can support up to a 10.5-inch, double-slot graphics card. The case is very compact, but there's still room for two hard drives and a slot-load optical drive (no drives included). You can also install an aftermarket CPU air cooler up to 5.5 inches in height. Builders who fancy watercooled setups will want to wait for the Hadron Hydro version, which EVGA says is coming soon.



Intel Introduces Bay Trail

Intel unveiled its successor to the Clover Trail family of Atom SoC (system-on-a-chip) processors. The new Atom family, code-named "Bay Trail," is based on a microarchitecture called "Silvermont" that Intel announced earlier this year, and is expected to offer significantly enhanced performance and battery life. The first processors in the family to be released are the Atom Z3000 series of chips that are designed for tablets, convertibles, and similar mobile devices. The new SoCs are based on a 22nm lithography process and have two or four cores. There is one instruction thread per core, but unlike previous Atom versions, Bay Trail allows for out-of-order instruction execution to increase performance. The new system memory controller supports one channel of DDR3L memory or up to two channels of LPDDR3, with a 64-bit data bus for each channel. You can expect to see a number of new mobile products based on Atom Z3000-level chips this holiday season.

HARDWARE MOLE



The Name Says It All

Phones, phablets, tablets—there's a wide range of screen sizes available that accept touchscreen input. Now that range is expanding to include what could be considered the biggest "tablet" around: the Mondopad from InFocus. The 70-inch Mondopad is actually a Windows 7 PC with built-in touchscreen capability and software set up as a giant tablet to facilitate presentations and other group communications. The system comes with pre-loaded applications that let you take and share notes or accept input from mobile devices via Wi-Fi. If you already have a videoconferencing setup, you can load the client software onto the Mondopad and use it as you would your PC (and if you don't, InFocus offers an affordable alternative from Vidtel). Get the Mondopad and you'll be able to share those, uh, brilliant brainstorming doodles you make during meetings with the special projects team.

Optoma Gets Fancy

Projector maker Optoma is going after the high end of the projection market—think big corporate conference rooms, museums, art galleries, and similar upscale, large-venue settings—with its newly named ProScene line of projection systems. The company says the ProScene line "represents the very best of Optoma's engineering and technology," with all units in the line offering brightness levels between 4,000 and 7,000 ANSI lumens, as well as superior image quality and enhanced reliability. The line will be backed up with a specially trained group of customer service agents that will be available 24/7, which is good news for those businesses and professional settings that can't afford downtime with their projectors. Pictured here is one of the members of the new ProScene line, the EH7700, which offers 7,000 lumens, WUXGA resolution, optional motorized lenses, and dual lamps for added reliability.



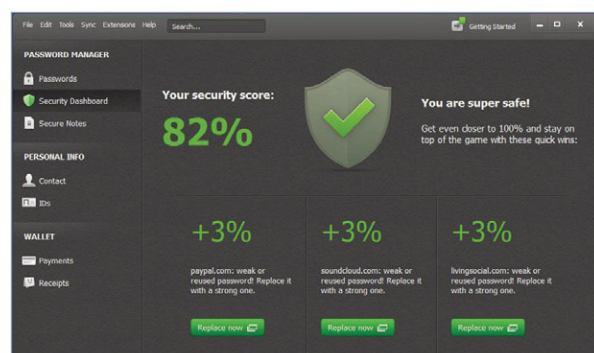


dotCloud Drops Docker 0.6

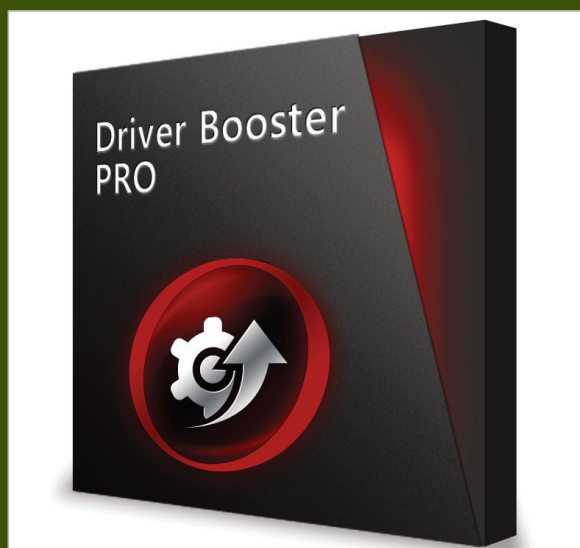
When everything works as advertised, cloud computing can make life easier for end users, but that ease of use and broad availability across any connected device takes a bit of work on the back end, as many devs can attest. Your app has to operate flawlessly across a variety of hardware and software environments and services, and this is where Docker comes in. To use dotCloud's analogy, Docker is like a cargo container for apps (if cargo containers were open-source and free); it protects your app and provides an efficient runtime environment for it across all kinds of hardware and a multiplicity of stacks, just like a cargo container protects physical goods and standardizes their transport on many types of vehicles along with many other types of goods. There are myriad uses for this, but in a nutshell it means you can build your app once and run it anywhere. The current release, 0.6, includes a host of improvements, including usability and security upgrades, bugfixes, and more.

Dashlane Makes The Jump To iPad

Dashlane is a tool for managing the snarl of online account logins that you need to get along in this modern, connected life. It provides auto-login services, acts as a digital wallet for online purchasing, and secures your login and payment info with AES-256 encryption, leaving no trace of your information anywhere on the web (or on your device, or on Dashlane's servers). You can also use it with Google Authenticator for two-factor authentication, and the software even analyzes the strength of your passwords and provides assessments on accounts that may have been breached. Now, in addition to Windows, Mac OS, iPhone, and Android versions, Dashlane is available for the iPad. This new version includes lots of cool features, including its own tabbed in-app browser, automatic screen caps of all purchases/receipts, and a prompt upon password creation to store the password and open the related app.

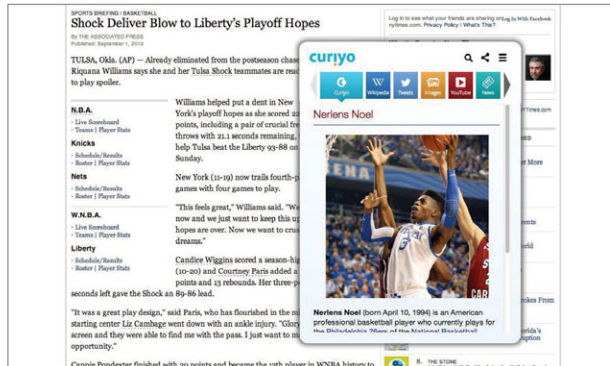


SOFTWARE SHORTS



IObit Driver Booster Wants To Help Manage Your Drivers

We all recognize the importance of keeping hardware drivers up-to-date, but let's face it: There are many other things vying for our time and attention, and as such driver updates often take a backseat until there's a problem. IObit offers a solution to this problem in the form of Driver Booster, a new utility that automatically checks your drivers and lets you know when there are available updates. The software then gives you the option of updating your drivers with a single click, which is clearly handier than having to go to each manufacturer's website and get them manually. Driver Booster is available as a free program, or you can get Driver Booster PRO (at press time, the PRO version cost \$28.95), which comes with a year of driver updates, support for three PCs, and an enhanced update engine that provides 300% faster updating over the free version.



Curiyo Brings The Web To You

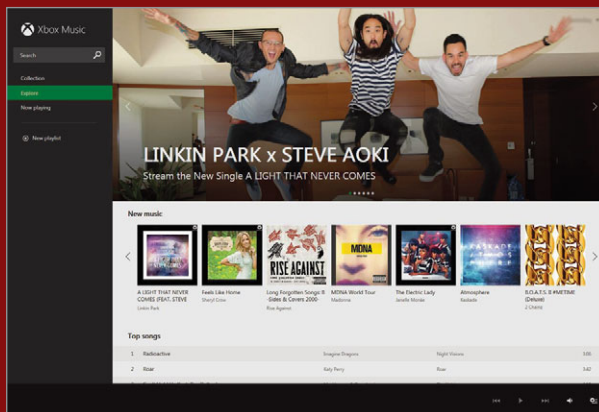
The web is a dangerously informative thing: a simple search can very easily spiral out of control as you link from one item to the next, to the point where you forget why you went online in the first place. Curiyo may not solve this problem, but it will make heading down that rabbit hole a little more convenient. Curiyo is a browser plug-in that checks the page you're reading and provides contextual information by subtly underlining key words and phrases in the text. If you'd like to know more (and we know you would), just "long-click" the underlined item and the Curiyo window pops up on-screen, providing archived information culled from Wikipedia, Who2, and other sources, plus current info from Twitter, YouTube, and more. In other words, rather than having to leave the page you're on to get the information you want, the information comes to you. Curiyo supports Internet Explorer, Firefox, Chrome, and Safari. The company also says by way of its FAQ that it is working on a mobile app.

eGood: Win, Win, Win

The idea of participating in loyalty programs at your favorite businesses is usually fairly compelling, but we could certainly do without the punch cards, program cards, key tags, printed coupons, and such. eGood replaces punch cards and membership cards with something you always have with you anyway: your smartphone. Just install the app, and participating businesses can track your purchases and give you the discounts and offers you have coming without all the fuss. eGood also adds a societal benefit in that participating businesses can choose worthy charitable causes to support based on your patronage, which means that you get the stuff you like/want/need, businesses have real-time access to your attention and to the results of their loyalty programs, and organizations like the Muscular Dystrophy Association, the American Heart Association, Shoes That Fit, and many, many others get the support they need to do their important work.



SITE SEEING



Xbox Music Free To Stream

Xbox Music has been available on Windows 8 devices and the Xbox 360 for about a year, but Microsoft recently began providing free streaming via the web, ostensibly to introduce new potential customers to the service and its catalog of music. At music.xbox.com, you can sign in with a new or existing Microsoft Account and get "unlimited access to millions of songs." After six months, the service limits free streaming to 10 hours per month, but of course if you've decided you like Xbox Music, you have the option of maintaining unlimited access by signing up for the Xbox Music Pass (formerly the Zune Pass) for \$9.99 per month. The service's catalog is large, the web interface is attractive and easy to use, and Xbox Music automatically syncs your song/album collection across any and all devices you use to access Xbox Music. For a more in-depth look at the service, see "Music By Microsoft" elsewhere in this issue.

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XPG V2 DDR3 DRAM Module



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Using Thermal Conductive Technology (TCT) and 2oz Copper 8-layer PCB, the specialized heat sink ensures outstanding stability when systems are pushed to the limit



ADATA XPG V2 DDR3 DRAM Module
Designed for 3rd Generation Intel Core Processors and the Z87 platform



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www.adata-group.com



Job Of The Month

With more than 430,000 employees worldwide, odds are IBM might just have a position that will interest you. Right now, for example, the Systems & Technology Group at IBM has several openings for entry-level “development product engineers” to assist in various phases of design, layout, architecture, simulation, synthesis, materials analysis, yield engineering, packaging, modeling, and you-name-it for semiconductor development and production. If you have a degree in Electrical, Chemical, Mechanical, or Material Sciences Engineering, or the old standbys Physics and Computer Engineering, and you can speak English (yes, that’s a requirement), you may have what it takes to be an official IBMer. The company has offices worldwide, but these particular openings are located in Vermont and New York. See Big Blue’s website for more info.

Source: www.ibm.com/employment

Where’s My PC? I Wanna Buy Something

Smartphones and tablets may be all the rage, but when it comes to buying products online, the venerable desktop is still the tool of choice for consumers. ComScore recently studied what platforms people use when they purchase various types of products. Overall, people use a desktop computer more than 90% of the time when making any online purchase. Smartphones are only used 6% of the time, and tablets 3.5% of the time.



Share Of Digital Commerce By Platform

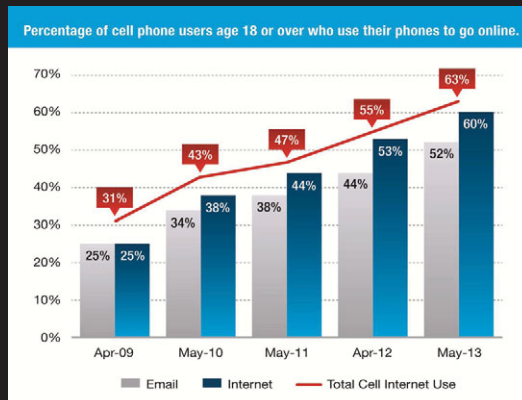
Commerce Category	Desktop	Smartphone	Tablet
All Digital Commerce	90.4%	6.0%	3.5%
Apparel & Accessories	90.3%	6.2%	3.5%
Computer Hardware	94.5%	3.3%	2.1%
Consumer Packaged Goods	95.6%	3.0%	1.3%
Consumer Electronics	94.4%	2.6%	2.9%
Event Tickets	84.6%	10.9%	4.5%

Source: ComScore

So . . . For A Third Of You, It’s Really Just A Phone?

A recent study by Pew Research found that while 91% of U.S. citizens now own a cell phone, fewer than two-thirds of those owners use their mobile phones to send email or access the Internet. The percentage is steadily increasing, however, and has doubled in just the last four years.

Source: PewInternet.org



RAW Numbers:

30

The width in microns of a copy of the Mona Lisa that was created recently by Georgia Tech researchers. The miniature copy, about 1/3 the width of a human hair, was made using ThermoChemical NanoLithography, a novel lithography technique that involves an atomic force microscope and heat-induced nanoscale chemical reactions.

(SingularityHub.com)

74%

Percentage of smartphone users ages 18 and over who use their phones to get directions or other information related to their physical location

(Pew Internet & American Life Project)

1,000

Average number of copies of Prince’s soundtrack to the movie “Purple Rain” that have sold every week for the last two decades.

(The Nielsen Company)

70.6 million

Number of results returned by Google for the search term “turkey recipe.”

(Google)

\$298 billion

Estimated value of worldwide semiconductor sales in 2013. The year-end sales total is forecast to rise 3% over 2012’s total.

(ABI Research)

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Extreme Inside

Intel's Core i7-4960X

Intel's Extreme Edition processors have been the gold standard among enthusiasts, gamers, and overclockers for a number of years, and with the recent launch of its "Ivy Bridge-E" parts, Intel has once again raised the bar for CPU performance. The processor at the head of that product family, the Core i7-4960X, is, simply put, the fastest, most powerful desktop CPU on the market today.

"The i7-4960X is the king of desktop processors," says Intel Product Marketing Engineer Darrin Lynch. "It gives you unparalleled multitasking capabilities at speeds that are unheard of anywhere else in the desktop world."

What makes the Core i7-4960X such a powerhouse? Although one could spend several pages giving an exhaustive answer to that question, in a nutshell it boils down to two crucial factors: architecture and features.

Architecture

In terms of its design, the Core i7-4960X is a greatest-hits compilation of architectural advances. It starts with Intel's 3D Tri-Gate transistor technology, which is incredibly efficient because it allows far less power leakage than previous transistor designs. This means

that in their "on" state, these transistors allow nearly as much current as possible to flow, and in their "off" state they

Intel's 22-nanometer manufacturing process, which allows the chip to pack 1.86 billion transistors onto a die that measures just 257mm².

It's also very important to note that this processor's amazing complexity allows for six full CPU cores, each of which can run two concurrent streams of instructions thanks to Intel's Hyper-Threading Technology. So if you're running highly threaded applications, such as content creation programs or games designed for multithreaded operation, you will get much faster performance than ever before. If you're running less-intensive workloads, you can have more programs open at once, and each will be much more responsive.

Features

The Core i7-4960X's raw performance is also aided by a generous 15MB of on-die Intel Smart Cache.

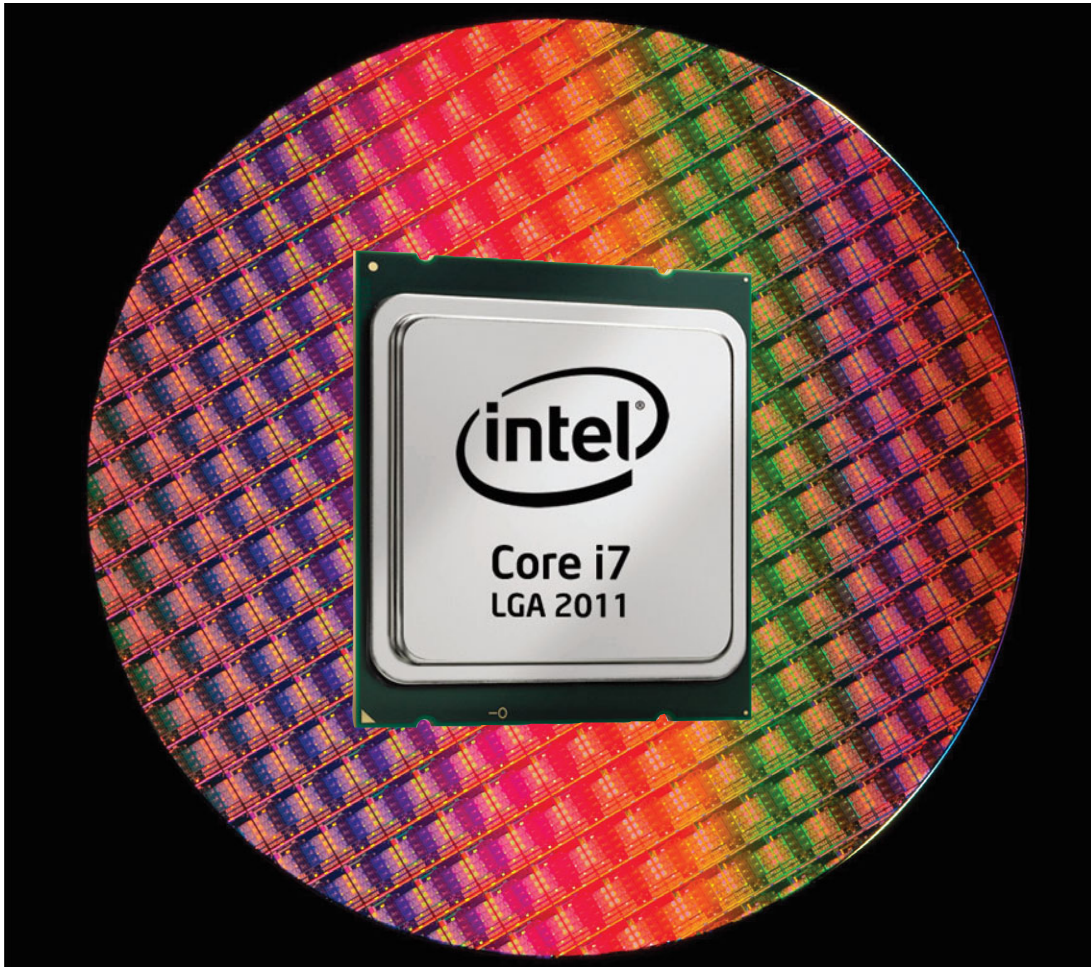
"Essentially, this is memory that stores the instructions that the CPU knows or thinks will be executed next," Lynch says.

"When I say 'think,' I mean that the CPU uses out-of-order execution algorithms to 'guess' at what you are going to do next. While the CPU is very good at guessing, there are misses—many, many misses.



allow almost no current; the upshot is higher performance and lower power consumption.

The Core i7-4960X combines this powerful, efficient transistor design with



However, there are more hits than misses, and because of the i7-4960X's cache size, I can load more instructions closer to the processors—misses are felt less because I have more instructions at the ready. A long explanation to say larger cache means more performance.”

Memory outside the chip is important, too, and the Core i7-4960X's on-die quad-channel memory controller supports up to a staggering 64GB of DDR3-1333, DDR3-1600, or DDR3-1866, offering up to 59.7GBps of memory bandwidth. And thanks to Intel's XMP (Extreme Memory Profile) 1.3, you can overclock your four channels and up to eight DIMMs of XMP-compatible memory quickly and easily without having to make manual adjustments to your BIOS settings. (Unless you want to!)

In addition, the newest Extreme Edition processor provides 40-lane PCI Express 3.0 support, so when paired with a properly equipped motherboard, it lets you incorporate up to four graphics cards in your build.

Finally, like its Extreme Edition predecessors, the Core i7-4960X is a fully unlocked CPU, which means that you have full access to all of its overclocking potential. Unlike previous processors, though, the 4960X gives you much more specific control; for example, you can overclock individual cores in real time, in addition to making power limit and turbo voltage adjustments. The chip is also designed to automatically scale its PEG and DMI settings back as you increase its BCLK ratios.

Performance

Lynch says the Core i7-4960X's performance improves on what previous Extreme Edition CPUs (which are still faster than every other CPU than this one) have achieved “in the range of five to 10 percent.” Add to that their even greater power efficiency and vastly improved overclocking controls, and he says choosing a CPU for your next build is a no-brainer.

“Highest core count of any desktop CPU—check. Highest thread count of any desktop CPU—check. Largest cache—check. Most memory channels—check. Most PCI-E lanes—check. If you want the best of the critical platform components, then the Core i7-4960X is hands-down the best choice for you.” ■

GIGABYTE H81.AMP-UP

We've covered a lot of Z87-based motherboards in recent months, and for good reason. The Z87 chipset is packed with more features than any other chipset in Intel's 8 Series. This month, we get our first look at the H81 chipset—Intel's entry-level chipset for Haswell processors—with GIGABYTE's GA-H81.AMP-UP. Don't let "entry-level" scare you away. The GA-H81.AMP-UP has many of the same tricks up its sleeve as pricier Z87 motherboards, so it deserves further examination as a potential budget-friendly champion.

The GA-H81.AMP-UP makes good use of the PCI-E graphics lanes and memory controller built into Haswell processors. You'll have 16 PC-E 3.0 lanes and support for up to DDR3-1600 at your disposal. The graphics layout on the H81 chipset is much different than what you'll find on most Z87 motherboards. The H81 chipset

supports one PCI-E x16 slot, running at the full x16 speed. The Z87's PCI-E lanes can break down into one into x8/x8 or x8/x4/x4 configurations, as well. In short, H81 doesn't have SLI/CrossFire support on its résumé, but if one card is all you need, it'll do the job.

Another important difference is that H81 supports only one memory module per channel; the dual-channel architecture of Haswell means that the GA-H81.AMP-UP gives you two DIMM slots that each max out at 8GB, for a maximum of 16GB. There's a slight reduction in SATA connectivity, as the stock H81 chipset offers two 3Gbps and two 6Gbps SATA ports. (The Z87 chipset has six 6Gbps SATA ports.) Other features missing on the H81 chipset are Smart Response Technology, Rapid Storage Technology, and overclocking support.

GIGABYTE designed the GA-H81.AMP-UP to entice audio enthusiasts on a budget. One of the key features on the board is the upgradeable onboard OP-AMP (operational amplifier), which lets you switch out and install different amplifiers on the motherboard to select a sound that suits your tastes. GIGABYTE also built in two onboard switches (which correspond with the left and right channels on a headset) that let you choose between 2.5x and 6x sound amplification modes. Other high-end audio features include support for 7.1-channel surround sound, an audio noise guard that shields the board's analog audio components from electrostatic discharge, and Nichicon audio capacitors.

For add-in cards, you'll find a single PCI-E x16 slot for your graphics card,



GA-H81.AMP-UP
\$89.99
GIGABYTE
www.gigabyte.us



as well as three PCI-E x1 slots and two PCI slots. If you opt to use the Intel HD Graphics built into your Haswell processor, the GA-H81.AMP-UP's HDMI output delivers a maximum resolution of 4,096 x 2,160. There are four USB 3.0 ports (provided through VIA VL805 chip) and three USB 2.0 ports on the rear chassis. A USB 3.0 header and two USB 2.0 headers give you additional connectivity options. Although GIGABYTE classifies the GA-H81.AMP-UP as an ATX motherboard, it's only 7.5 inches wide, rather than the standard 9.6 inches. The slimmer width makes the GA-H81.AMP-UP a good choice for midtower cases (or smaller), because you'll have a bit more free space along the motherboard tray.

We ran the GA-H81.AMP-UP through the same set of benchmarks used on the Z87 motherboards we've reviewed, and this board put up numbers that were near or better than what we've previously seen. Our test rig consisted of an Intel Core i7-4770K,

8GB of ADATA XPG V1 DDR3-1600 memory, and a GIGABYTE GV-N760OC-4GD graphics card. In PCMark 8, we saw a Creative Score of 5213, while our test system produced an overall score of 3058 in 3DMark Professional. Marks of 8.52 in Cinebench 11.5 and 1609.3 in POV-Ray 3.7 Beta are also impressive. At a resolution 2,560 x 1,600 with the highest settings, our Metro: Last Light (27.11fps) and Aliens vs. Predator (31.4fps) benchmarks showed that this motherboard has some gaming chops.

GIGABYTE has complemented the H81 chipset with lots of audio features that make it ideal for gamers looking to build a system on the cheap, as you'll also be able to enjoy the key perks of a Haswell processor and have a full-speed PCI-E x16 slot for a single high-end graphics card. Entry-level motherboards need not be featureless, as the sub-\$90 GA-H81.AMP-UP capably proves. ■

BY NATHAN LAKE

Benchmark Results	GIGABYTE GA-X79-UP4
3DMark Professional (Fire Strike Extreme)	3058
Graphics Score	3156
Physics Score	10336
PCMark 8	
Creative Score	5213
SiSoftware Sandra 2013 SP5 Lite	
Dhrystone SSE4.2 (GIPS)	137.28
Whetstone iSSE3 (GFLOPS)	100.17
x32 Multi-Media Integer AVX2 (Mpixels/s)	423.32
x16 Multi-Media Float FMA3 (Mpixels/s)	416.75
x8 Multi-Media Double FMA3 (Mpixels/s)	239.41
x8 Multi-Media Float/Double FMA3 (Mpixels/s)	315.87
Integer B/F AVX/128 (GBps)	18.8
Floating B/F AVX/128 (GBps)	19
POV-Ray 3.7 Beta*	1609.3
Cinebench 11.5**	8.52
Games (2,560 x 1,600)	
Metro: Last Light (4XAA, 16XAF)	27.11fps
Aliens vs. Predator (4XAA, 16XAF)	31.4fps
* pixels per second	
** points	

Specs: Max memory: 16GB (DDR3-1600); Slots: 1 PCI-E 3.0 x16, 3 PCI-E x1; 2 PCI; Storage: 2 6Gbps SATA, 2 3Gbps SATA; Rear I/O: 1 HDMI, 4 USB 3.0, 3 USB 2.0, Ethernet, 1 S/PDIF out, audio I/O, 1 PS/2; Form factor: ATX; Warranty: 3 years

Test system specs: Processor: Intel Core i7-4770K; GPU: GIGABYTE GV-N760OC-4GB; RAM: 8GB ADATA XPG V1 DDR3-1600; Storage: 128GB Crucial RealSSD C300; OS: Windows 8 Enterprise (64-bit)

GIGABYTE GA-X79-UP4

With the release of Intel's Ivy Bridge-E processors, we decided it'd be a good idea to check out a motherboard that recently received a BIOS update to support the new CPUs. Enter GIGABYTE's GA-X79-UP4; the current model now ships with a BIOS that's compatible with Ivy Bridge-E CPUs. GIGABYTE's claim to fame with the GA-X79-UP4 is that the board supports four-way CrossFire and SLI, ideal for high-end gamers and performance enthusiasts. Overclockers will also like that the GA-X79-UP4 is built with GIGABYTE's 3D Power that offers you both hardware- and software-based controls for real-time monitoring and adjustments for the CPU and memory.

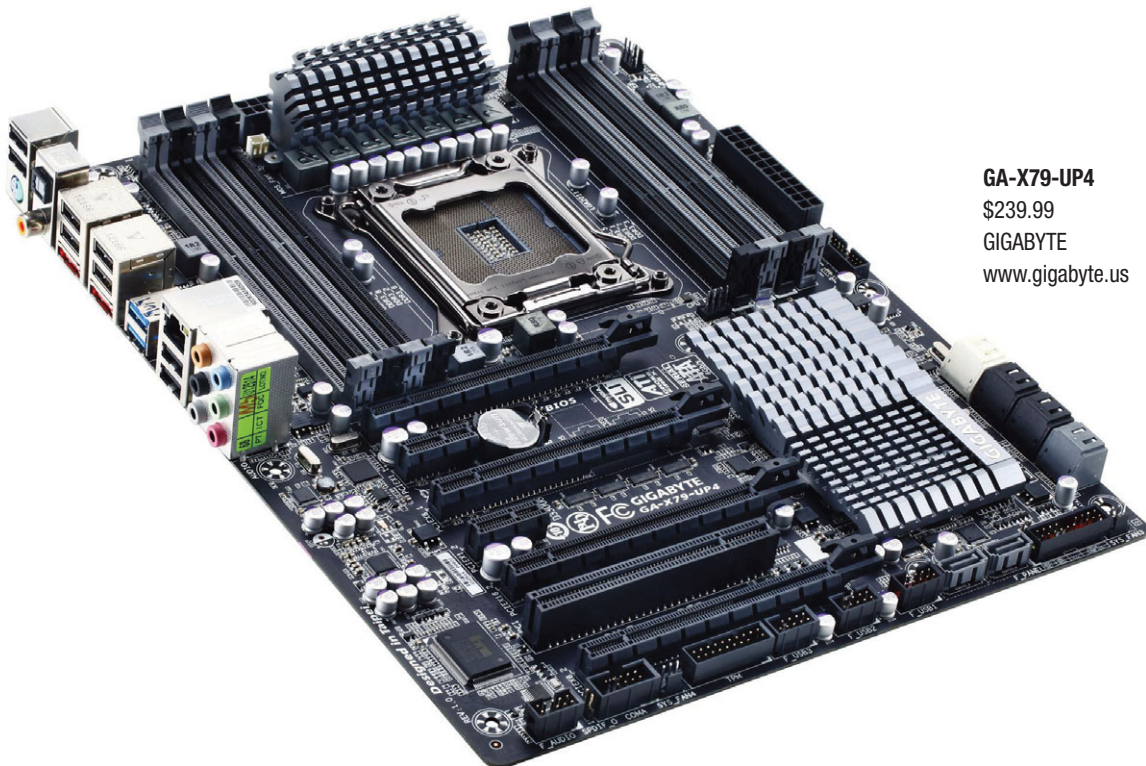
Like all motherboards based on the X79 chipset, the GA-X79-UP4 is built to work with quad-channel memory. This board's memory capabilities are even more impressive when you consider that it can support up to 64GB of memory (spread

across eight DIMM slots) clocked up to 2,133MHz. To better support overclocking, the GA-X79-UP4 utilizes GIGABYTE's Ultra Durable 5 technology. The list of Ultra Durable 5 components consists of IR3550 PowIRstage integrated circuits, ferrite core chokes rated at up to 60A, and twice as much copper (0.070mm vs. 0.035mm for the power and ground layers) in the PCB than typical motherboards. GIGABYTE indicates that the Ultra Durable 5 features can deliver temperatures up to 60 degrees Celsius cooler than what you'd find on traditional motherboards.

In terms of graphics performance, the GA-X79-UP4 harnesses all 40 PCI-E lanes in a Sandy Bridge-E or Ivy Bridge-E processor. GIGABYTE built the motherboard with four PCI-E x16 slots—two that operate at x16 speeds and two slots that run at x8. With four-way SLI or CrossFire, the top slot will run at x16 speed, while the rest run at x8 speeds. In situations with three GPUs, you'll

want to install the third card into the top PEG slot that runs at x8. This way, you'll have two cards operating at x16 speed and one at x8 speed. With two graphics cards, you'll want to install both into the PCI-E x16 slots that run at x16, so you'll get the full available bandwidth for both GPUs. All the PCI-E slots conform to the PCI-E 3.0 standard. You'll also find two PCI-E x1 slots (PCI-E 2.0 standard) and a legacy PCI slot.

The storage interface includes the X79 chipset's default two 6Gbps and four 3Gbps SATA ports (supporting RAID 0, 1, 5, and 10 configurations), and GIGABYTE added a Marvell 88SE9172 chip to give you an extra four 6Gbps SATA ports and two 6Gbps eSATA ports on the rear panel. The Marvell 88SE9172 ports support RAID 0 and RAID 1. The GA-X79-UP4 supports high-capacity storage via the 3TB+ Unlock utility. You'll find plenty of connectivity on this board, as there are 14 USB 2.0 ports (eight on rear panel, six via the three internal headers) and

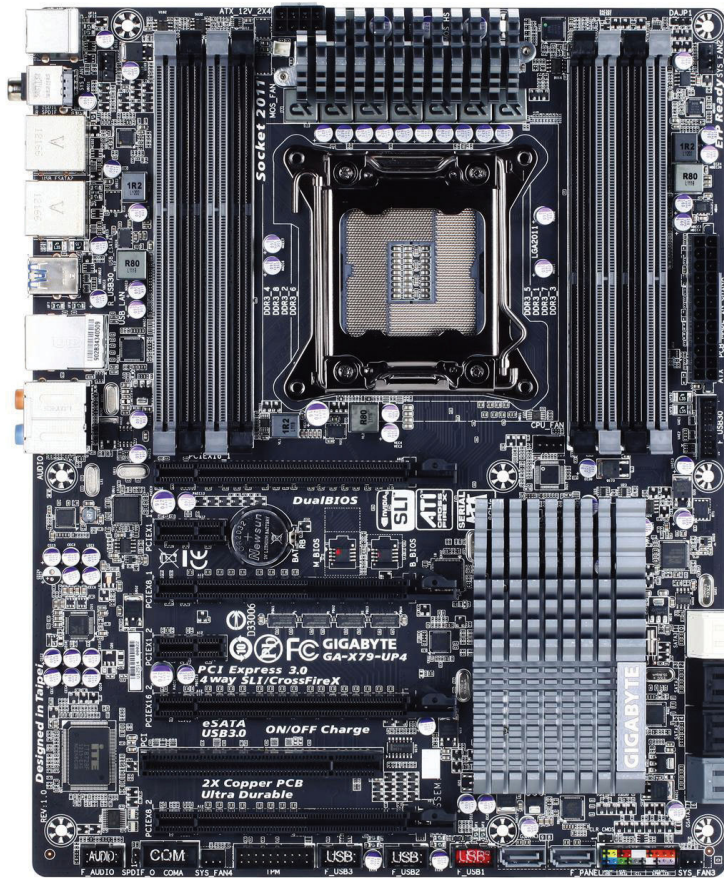


GA-X79-UP4

\$239.99

GIGABYTE

www.gigabyte.us



four USB 3.0 ports (two on rear panel, two ports through one internal header). All of the USB ports are designed to provide three times the traditional USB power to quickly charge phones, tablets, and other devices.

We tested the GA-X79-UP4 with Intel's new Core i7-4960X at stock clocks. Our test system also included an XFX Radeon HD 7970 and 16GB of Patriot Memory's Viper Xtreme Division 4 DDR3-1866. The hardware produced an excellent overall score of 3562 in 3DMark Professional's Fire Strike Extreme test, which consists of a Graphics score of 3640 and Physics score of 14857. The quad-channel memory performance was also impressive, at 43.88GBps and 43.77GBps in SiSoftware Sandra 2013 SP5

Lite's Memory Bandwidth test. As you might expect from Intel's newest processor, we saw extremely high marks in the processor-intensive POV-Ray beta (2137.17 pixels per second) and Cinebench 11.5 (12.13 points).

Overclocking enthusiasts should enjoy the 3D Power and Ultra Durable 5 technologies GIGABYTE added around the X79 chipset, because it will give them the extra headroom necessary to create stable, high overclocks. And gamers should like this board's support for up to four-way SLI or CrossFire, so your frame rates are limited only by your system budget. Either way, the GA-X79-UP4 has what you need to create a benchmark-busting rig. ■

BY NATHAN LAKE

Benchmark Results	GIGABYTE GA-X79-UP4
3DMark Professional (Fire Strike Extreme)	3562
Graphics Score	3640
Physics Score	14857
PCMark 8	
Creative Score	4689
SiSoftware Sandra 2013 SP5 Lite	
Dhrystone SSE4.2 (GIPS)	164.32
Whetstone iSSE3 (GFLOPS)	127.73
Multi-Media Integer Native x16 (Mpixels/s)	328
Multi-Media Float Native x16 (Mpixels/s)	431
Multi-Media Double Native x8 AVX (Mpixels/s)	242.59
Multi-Media Float/Double Native (Mpixels/s)	323.37
Integer B/F AVX/128 (GBps)	43.88
Floating B/F AVX/128 (GBps)	43.77
POV-Ray 3.7 Beta*	2138.17
Cinebench 11.5**	12.13
Games (2,560 x 1,600)	
Metro: Last Light (4XAA, 16XAF)	32fps
Aliens vs. Predator (4XAA, 16XAF)	41fps
* pixels per second	
** points	

Specs: Max memory: 64GB (DDR3-1600; Max OC: DDR3-2133); Slots: 4 PCI-E 3.0 x16, 2 PCI-E x1, 1 PCI; Storage: 6 6Gbps SATA, 6 3Gbps SATA; Rear I/O: 2 USB 3.0, 8 USB 2.0, 2 eSATA, Gigabit Ethernet, 2 S/PDIF-out (1 optical, 1 coaxial), audio I/O, 1 PS/2; Form Factor: ATX; Warranty: 5 years

Test system specs: Processor: Intel Core i7-4960X; GPU: XFX Radeon 7970; RAM: 16GB Patriot Memory Viper Xtreme Division 4 DDR3-1866; Storage: 1TB Western Digital WD Black; OS: Windows 8 Enterprise (64-bit)

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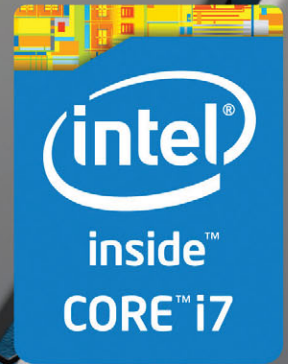
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4670 3.40Ghz \$ 1055
4570 3.20Ghz \$ 1029
4430 3.00Ghz \$ 1019
Intel® Core™ i3 Processor
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17.3" Full HD Display 1920x1080
16GB DDR3 1333 Memory
64GB SATA III 6.0Gb/s SSD
1TB SATA300 Hard Drive
Nvidia® GeForce® GTX 770M 3GB Direct X 11 Video Card
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ADATA XPG SX900 128GB

Solid-state drives are everywhere these days, and that's a very good thing. Long gone are the days when we scrimped, saved, and wolfed down a steady diet of ramen to have enough scratch for an SSD barely large enough to hold a Windows installation.

Now, as NAND prices continue to trend downward, we're putting SSDs in our secondary and tertiary systems. We're including them in builds for friends and family. It helps that we now have a diverse selection of drives at a wide range of prices, performance levels, and capacities.

ADATA's 128GB XPG SX900 SSD recently docked in our test bay, so we feel obligated to give you the 411 on this slim (it measures 7mm thick) drive. Although the XPG SX900 SSD is part of ADATA's enthusiast SSD line, the 128GB could easily find a home in a number of different systems.

The heart of the XPG SX900 is the venerable LSI SandForce SF-2281 controller, basically a living legend in the pantheon of SSD controllers. The SF-2281 in the XPG SX900 has received a full tune-up in the form of the B02 stepping and ADATA's 5.0.7a firmware. Enthusiasts looking for an SSD upgrade for their laptop will want to take note: this new stepping makes big strides in reducing power consumption, particularly at idle. We don't need to tell you how much of a boon this is for battery life. According to ADATA, tweaks to the drive end up netting you about 7% more capacity over other SandForce-based SSDs.

We sent the XPG SX900 for a couple of laps around the CrystalDiskMark track, once with an incompressible workload and another with a compressible workload that SandForce controllers devour. We've tested

Benchmark Results	ADATA SX900
CrystalDiskMark 3.0.2 (64-bit, default)*	
Sequential read	446.1
Sequential write	195.1
512K read	372.7
512K write	193.8
4K read	29.84
4K write	106.6
4K QD32 read	126.1
4K QD32 write	189.6
CrystalDiskMark 3.0.2 (64-bit, all 0x00, 0 fill)*	
Sequential read	441.3
Sequential write	474.3
512K read	398.9
512K write	437.3
4K read	33.97
4K write	107.1
4K QD32 read	135.2
4K QD32 write	361.2
*MBps	

our fair share of other SSDs based on the 2281's controller, and for a drive of this pedigree, the XPG SX900 holds its own.

The XPG SX900 wears a lot of hats, but it wears them well. It has the performance power users want, but its capacity and price make it impossible to ignore for everyday users. ■

BY VINCE COGLEY

Specs: Sequential read/write (advertised, ATTO): 555MBps/535MBps; Max 4K write (advertised): 90,000 IOPS; Interface: 6Gbps SATA; Height: 7mm; Warranty: 3 years
Test system specs: CPU: Intel Core i7-4960X; Motherboard: GIGABYTE GA-X79-UP4; GPU: XFX Radeon HD 7970; RAM: 16GB Patriot Memory Viper Xtreme Division 4 DDR3-1866; Windows 8 Enterprise (64-bit)



Thermaltake Commander F5

Fan controllers have always been an accessory for the most meticulous (read: borderline OCD) of power users. Enthusiasts who want to take control of their system's air cooling almost always dedicate a bay or two to a fan controller. The Commander F5, Thermaltake's latest fan controller, is an offering for fan controller fans who like to keep things simple.

The Commander F5 fits in a single 5.25-inch bay and has connectors for five fans. Other than its metal mesh front panel, the Commander F5 has a plastic body. As it turns out, the plastic construction gives the Commander F5 a surprisingly solid feel, as opposed to fan controllers that have thin steel bodies that tend to feel somewhat flimsy. Further, all of the power cables are soldered firmly to the Commander F5's PCB; we weren't worried that

we'd rip a cable loose by pulling on it. Ruggedness isn't something you associate with fan controllers, but the Commander F5 has it. We're not complaining.

A single Molex connector supplies the Commander F5 with power, which in turn doles out up to 8 watts of juice per channel to connected case fans. The main power cable measures 7.9 inches, long enough snake behind a case and hook up with a 4-pin Molex connector from the PSU. Each fan power cable measures 23.6 inches long, which should be long enough to reach rear panel case fans in all but the deepest of chassis.

Whereas most fan controllers use touch-sensitive controls or physical dials, the Commander F5 gives us sliders, not unlike an audio equalizer. There are also five LEDs built into

the Commander F5's front panel, and they light up when a fan is connected. Adjust each of the five sliders as necessary, balancing between airflow and noise. According to Thermaltake, bottoming out the sliders doesn't completely disable the connected fans; in order to prevent system overheating, they'll continue to spin, although at greatly reduced RPM.

For 20 bucks, the Commander F5 gives you the ability to fine-tune your system's air cooling. If you need to wrangle unruly case fans, this little unit will keep them in check. ■

BY VINCE COGLEY

Commander F5

\$19.99

Thermaltake

www.thermaltakeusa.com

Specs: Connectors: 5 3-pin connectors; Max wattage per channel: 8W; Cable length: 7.9 inches (main power), 23.6 inches (fan power cables); Compatibility: 5.25-inch bay

**Galaxy-01**

\$49.99

Rosewill

www.rosewill.com

Rosewill Galaxy-01

Thrifty do-it-yourself PC builders are always looking for ways to stretch their parts budgets, and unfortunately sometimes that means making significant compromises in the way a PC performs or the way it looks. If you're careful, though, sometimes you can find parts that look great and get the job done performance-wise without costing an arm and a leg; Rosewill's new Galaxy-01 midtower (part of a three-unit family of Galaxy cases) is one example of this.

The Galaxy-01 is compact and light (both of which you'll appreciate if you're a LAN party fan) and will only set you back 50 bucks, but it has a surprisingly generous list of amenities. For starters, the case comes with three preinstalled 120mm fans (a blue LED fan up front and black 120mm fans at the rear and

up top), so you don't have to give up decent airflow. It also has a USB 3.0 port toward the front of the top panel with an internal header connection, and there's a spot where you can add another if you are so inclined. There is a dedicated SSD mount on the inside of the left side of the drive cage frame, and a motherboard tray with a big cutout that will make installing a CPU cooler a snap.

The front and top panels both pop off easily so that you can work with the fan mounts and drive bays beneath, there's a removable dust filter beneath the bottom panel's power supply mount, and Rosewill put three rubber-grommeted watercooling holes at the top of the rear panel.

And because Rosewill understands that you want a case that looks as good

on the inside as it does on the outside, the Galaxy-01 has a matte black internal finish, three good-sized cable routing cutouts in the motherboard tray, and space between the tray and the right side panel to actually put some cables.

In fact, tool-less drive bays are about the only thing you don't get with the Galaxy-01 that you will find in more expensive cases, and we tend to think that this is a very small price to pay for getting a case that looks this nice and is this build-ready for so little cash.

The Rosewill Galaxy-01 proves that you don't have to spend a lot of money to get an attractive, functional computer case, and that's good news regardless of your budget. ■

BY CHRIS TRUMBLE

Specs: Dimensions: 18.5 x 8.2 x 18.5 inches (HxWxD); Materials: Steel, plastic; Motherboard support: mATX, ATX; Bays: 3 5.25-inch external, 1 3.5-inch external, 4 3.5-inch internal, 1 2.5-inch internal; Fans (included): 1 120mm blue LED front, 1 120mm rear, 1 120mm top; Fans (optional): 1 120/140mm left side; Ports: 1 USB 3.0, 2 USB 2.0, audio I/O

Intel Core i7-4960X

The king is dead, long live the king. Intel's Sandy Bridge-E has enjoyed a long and prosperous reign, but the time has come for it to pass the throne to its successor, Ivy Bridge-E. Here, we examine Intel's Core i7-4960X, the flagship CPU of the Ivy Bridge-E lineup.

Like its predecessor, the Core i7-3970X, the unlocked 4960X features six cores with Hyper-Threading, 15MB of Intel Smart Cache, 40 PCI-E lanes, and a quad-channel memory controller. The biggest difference is that the 4960X runs at 3.6GHz (with a 4GHz Max Turbo), while the 3970X runs at 3.5GHz with a 4GHz Max Turbo. The Core 4960X is also more energy-efficient than the 3970X, as it has a maximum TDP of 130 watts, compared to the 150W TDP of the Sandy Bridge-E champion. A big bonus of the Ivy Bridge-E architecture is that the chips will work in most existing X79-based motherboards with the help of a BIOS update.

Ivy Bridge-E offers some key improvements over Sandy Bridge-E. For example, the memory controller on Ivy-Bridge-E processors adds support for DDR3-1866, while Sandy-Bridge-E topped out at 1,600MHz. The difference is a theoretical memory bandwidth of 59.7GBps vs. 51.2GBps. You'll also find support for Intel XMP 1.3 profiles and an unlocked multiplier that can reach up to 63X. (Sandy Bridge-E was limited to 57X.) We also like the Ivy Bridge-E processors offer real-time overclocking potential, so you can change core speed, power limits, and turbo voltage at the OS level without requiring a reboot.

Ivy Bridge-E processors use the same cores found in standard Ivy Bridge processors, so they support extensions like Intel AVX, as well as SSE4.1 and SSE4.2 instruction sets. There are two other processors in the Ivy



Core i7-4960X
\$1,059
Intel
www.intel.com

Bridge-E lineup. The Core i7-4930K features a base clock of 3.4GHz with a 3.9GHz Max Turbo and a 12MB cache. Like the flagship model, the Core i7-4930K has six cores with Hyper-Threading. As of press time, Intel listed the MSRP of the 4930K at \$594. The last chip in the lineup is the Core i7-4920K, which has four cores with Hyper-Threading and a base clock of 3.7GHz (Max Turbo 3.9GHz). Intel Smart Cache drops to 10MB in the 4920K, but the MSRP is a mere \$332.

We ran the Intel Core i7-4960X through our lineup of benchmarks to give you an idea of how the new Extreme Edition CPU performs. PCMark8's Creative test provides a good measure of a processor's overall performance; here the 4960X turned in a score of 4689. In SiSoftware Sandra's Processor Arithmetic test, the 4960X hit marks of 164.32GIPS and 127.73GFLOPS in the Dhrystone iSEE4.2 and Whetstone iSSE3 benchmarks, respectively. Sandra's Memory Bandwidth tests helped show off the quad-channel controller, as the four Patriot modules working simultaneously scored speeds of 43.88GBps and 43.77GBps.

The Ivy Bridge-E CPUs fit well with the "tick" portion of Intel's release schedule, which is historically a die shrink, rather than the big architecture changes associated with "tock" releases. Naturally, enthusiasts building rigs that need the best of the best will want the

Benchmark Results	Intel Core i7-4960X
3DMark Professional (Fire Strike Extreme)	3562
Graphics Score	3640
Physics Score	14857
PCMark 8	
Creative Score	4689
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Dhrystone SSE4.2 (GIPS)	164.32
Whetstone iSSE3 (GFLOPS)	127.73
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Multi-Media Float/Double Native (Mpixels/s)	323.37
Integer B/F AVX/128 (GBps)	43.88
Floating B/F AVX/128 (GBps)	43.77
POV-Ray 3.7 Beta*	2138.17
Cinebench 11.5**	12.13
Games (2,560 x 1,600)	
Metro: Last Light (4XAA, 16XAF)	32fps
Aliens vs. Predator (4XAA, 16XAF)	41fps
* pixels per second	
** points	

Intel Core i7-4960X, as it's the undeniable top model available for the X79 chipset. ■

BY NATHAN LAKE

Specs: Socket: Intel LGA2011; Clock speed: 3.6GHz (4GHz Max Turbo); 15MB Intel Smart Cache; Memory support: 4 channels, DDR3-1866; TDP: 130W; Cores: 6; Hyper-Threading

Test system specs: Motherboard: GIGABYTE GA-X79-UP4; GPU: XFX Radeon HD 7970; RAM: 16GB Patriot Memory Viper Xtreme Division 4 DDR3-1866; Storage: 1TB Western Digital WD Black; OS: Windows 8 Enterprise (64-bit)

**RHMS-13001**

\$129.99

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**RHMS-13002**

\$219.99

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**RHMS-13003**

\$129.99

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Rosewill RHMS-13001/RHMS-13002/RHMS-13003

Despite its ergonomic importance, the ability to position the screen ideally is not a major selling point for most displays. So once you've found a panel (or two) that supports your desired native resolution, contrast ratio, response time, and backlight type, toss that hunk of plastic bolted to its backside. Investing in a quality aftermarket monitor mount can give you more freedom to pan, tilt, swing, elevate, and lower your display or displays as desired.

Rosewill's latest mounts are strong, attractive, and allow an impressive amount of fluid movement. Rosewill's RHMS-13000 series mounts are constructed of rigid yet lightweight aluminum, feature sturdy C-clamp column supports, and let you quickly snap arm extensions and the monitor with mount in place for effortless and rapid setup.

The silver finish and black joints look good, yet these mounts don't draw needless attention to themselves. Each joint also features a threaded hex insert (hex keys included) that you can tighten enough to keep the joint stationary, yet leave loose enough to still adjust the screen position

fluidly. The modular design also lets you add or remove arms to allow more freedom of movement or reduce the overall height of the display. Each of these mounts also comes with a cable management clamp, and the arms all feature channels to keep cables tucked out of sight.

Rosewill RHMS-13001 Universal Monitor Swivel Arm

This mount features the same C-clamp stand as the other units, but it comes with two snap-in swivel arms that add up to 16 inches of extension. This mount can support a single monitor up to 30 pounds with a screen size of up to 27 inches. The VESA-compliant mount fit on the Dell, Lenovo, and IBM displays we used to test with, and there's an included bracket for installing Apple's 27-inch Cinema Display or the 24-inch iMac.

Rosewill RHMS-13002 Monitor Dual Swivel Arm

This unit features a similar dual extension arm design as the RHMS-13001, but doubles it up to support two monitors at once. It can support a combined weight of

44 pounds and two displays up to 27 inches. (Apple display brackets are also included.) We particularly like that you can arrange the displays as a concave or convex surface, depending on whether they're designed to be viewed by one or multiple people. There was also zero noticeable droop with the pair of 17-inch displays we used side by side.

Rosewill RHMS-13003 LCD Monitor Spring Arm

The RHMS-13003 is similar to the RHMS-13001, except that it drops one of the stationary extension arms in exchange for a spring arm, which lets you quickly raise and lower a single display very quickly. The spring arm is longer than the extension arm, so this unit affords up to 20 inches of total extension. It can support displays up to 30 inches and 19 pounds.

If you're in the market for a display mount, Rosewill has your single- and dual-monitor needs covered. We're crossing our fingers that Rosewill launches a triple-monitor unit in short order. ■

BY ANDREW LEIBMAN

Specs: Aluminum construction, VESA-complaint, hex key inserts for adjusting tension, hex keys included, cable routing clips, C-clamp bases



GX Gaming Manticore

The Manticore is a gaming keyboard that's equipped with eight macro keys. GX Gaming makes it easy to create macros, too, as there's a utility that lets you configure three game profiles (bringing the total number of macros to 24), and you can instantly switch between them using the P1, P2, and P3 buttons on the bottom of the keyboard. All this is great for competitive gamers, of course, but it only gets better.

GX Gaming designed this keyboard for those who play MMO and RTS games. The eight macro keys are located along the left side, which makes them fairly easy to reach. We were able to do so without looking away from the screen. The Manticore also lets you record and assign macros during a game using only the keyboard. This way, when you're between tense moments in a match, you don't need to waste time jumping out of the game and into a macro recording utility if you need to reconfigure a macro. The Manticore has

32KB of onboard memory for storing those macros.

For nearly instantaneous reaction time, the Manticore offers a 1,000Hz polling rate. Support for 20-key antighosting makes virtually any key combo possible. The Manticore's keys are backlit, and you can choose from a palette of 16 million RGB colors to customize the backlighting. Further, GX Gaming breaks up the Manticore's backlit keys into three clusters that you can independently manage via the keyboard's utility. The largest light cluster includes the macro keys, function keys, and all the QWERTY keys. The second light cluster consists of the arrow keys, as well as the INS, DEL, HOME, and PRT SCR keys. The third light cluster is the number pad. For brightness, a dedicated button lets you select one of three brightness levels: 33%, 66%, and 100%. You can also disable the backlighting if that's not your thing.

At the top of the Manticore, you'll find a set of multimedia controls. We like this because you won't need to press any combination of function keys when you want to play, pause, or change volume. There's a two-port USB hub on the upper right side of the keyboard where you can plug a mouse or other peripherals. A palm rest is built into the bottom of the keyboard for comfort while gaming.

The Manticore's keys were responsive and provided solid feedback during our testing. We also liked how easy it was to reach and press the macro buttons. The Manticore is a solid choice for gamers who want an easy way to manage keybinds and like having color-coded sets of keys. ■

BY NATHAN LAKE

Manticore

\$79.99

GX Gaming

www.gx-gaming.com

Specs: Interface: USB; Cable length: 5.9 feet; Rubber dome keyswitches; 20-key rollover; Backlight: 16 million RGB colors; Polling rate: 1,000Hz

**A30i**

\$109.99

Thermaltake

www.thermaltakeusa.com

Thermaltake Armor A30i

Building a solid small form factor case is almost always easier in theory than in practice. Naturally, manufacturers can talk the talk: “We’ve shrunk our popular Mondo Hardcore Power User full tower chassis down to size while sacrificing almost none of its high-end features!” What happens far too often, though, is that the finished product falls victim to small-mindedness. (That’s hubris, son, overconfident posturing, through and through.)

With the Armor A30i, Thermaltake goes to great lengths to avoid empty promises, tackling head-on one of the most common shortcomings found in SFF cases: usability. The A30i is more or less completely modular (which, yes, we’re well aware sounds like we’ve hired Brian Fantana to ghostwrite hardware reviews). You can’t break the Armor A30i down into its individual pieces and then snap them back together any way you see fit, but you can pull the

motherboard tray and drive cages free from the chassis and install your system components out in the open. This simplified installation for us and saved us from having to contort fingers and cables alike to connect everything. For a moment, we thought we were working with a full-sized case.

The versatile Armor A30i scored big points with us for its graphics card support. The case makes room for graphics cards up to 13.7 inches long. That’s not bad for a case that measures 18 inches deep. If you want to go all in, you have enough space to install a pair of dual-slot cards.

Elsewhere, be aware that the Armor A30i has to contend with the same realities as other SFF cases. Namely, its physical footprint influences compatibility and clearance to a certain extent. Motherboard support is limited to mATX or Mini-ITX boards, but given the availability of worthy high-end mATX mobos, we don’t

want our SFF case to be at least 2.4 inches wider just so it can boast ATX compatibility. (Remember what we told you about hubris?) You do need to know that the vertical ceiling for CPU coolers is 3.5 inches.

That said, the Armor A30i supplies a fair amount of ventilation out of the box. It’s equipped with the following four fans: one 90mm front, one 200mm top, and two 60mm rear. These keep air moving through the case, which, as any SFF aficionado will tell you, is kind of a big deal. Blue LEDs on the front and top fans helps the Armor A30i hit a nice visual note—resonance without distortion.

You’ll likely still need two arms to tote around any system you build within the Armor A30i, but hauling it to and from a LAN party should be much easier than any upright chassis. Give it a good look if you’re planning to go small with your next build. ■

BY VINCE COGLEY

Specs: Dimensions: 10.5 x 11.5 x 18 inches (HxWxD); Materials: Steel, plastic; Motherboard support: mATX, Mini-ITX; Bays: 2 5.25-inch external, 1 3.5-inch external, 2 2.5-inch internal, 2 3.5-inch internal; Fans: 1 90mm blue LED front, 2 60mm rear, 1 200mm blue LED top; Ports: 2 USB 3.0, audio I/O



GeForce GTX 760 WINDFORCE OC

\$299.99

GIGABYTE

www.gigabyte.us

GIGABYTE GeForce GTX 760 WINDFORCE OC (GV-N7600C-4GD)

By now, you probably have at least a passing familiarity with NVIDIA's GeForce GTX 700 series of graphics cards. The most recent addition to the family is the GTX 760. Today we're looking at GIGABYTE's overclocked WINDFORCE unit, particularly the model equipped with a 4GB frame buffer.

Like the GeForce GTX 770 we've dissected in recent issues, the GTX 760 takes a familiar GPU, the GK104, and spruces it up in a number of ways so that the end result resembles the love child of a GTX 660 Ti and the GTX 670. This GPU is manufactured at 28nm and features three active Graphics Processing Clusters for 1,152 CUDA cores, 96 texture units, and 32 ROPs. Interestingly, the CUDA core and texture unit count is down from the 660 Ti, but the GPU in the 760 has more ROPs and a wider 256-bit memory bus compared to the 660 Ti's 192-bit bus. This results in a card with slightly less texture and shader performance but better memory bandwidth and ROP throughput.

Despite being just a 170-watt graphics card, GIGABYTE strapped on its WINDFORCE

3X cooler with Triangle Cool technology, giving the card the ability to dissipate an impressive 450 watts of thermal energy. To accomplish this feat, GIGABYTE turns to three 92mm PWM fans, a collection of heatpipes, and a large vapor chamber bristling with aluminum fins. Like other GIGABYTE graphics cards, this one comes with Ultra Durable VGA technology, which consists of Japanese solid capacitors, a unified Driver MOSFET, ferrite core chokes, and 2 ounces of copper in the PCB. As a result, this GeForce GTX 760 runs cooler, overclocks better, and suffers from significantly less power leakage. On the energy-efficient 760, this cooler is an overclocker's best friend.

In the benchmarks, this card posted a 3058 overall score in 3DMark's Fire Strike Extreme benchmark. In the tessellation-heavy Unigine Heaven benchmark, this card manages 30.7 frames per second and a 773 raw score, which helps illustrate the point that this card was built to handle DX11's most demanding visual effects. In the real-world benchmarks, we saw impressive numbers at 1,920 x 1,200

Specs & Scores	GIGABYTE GV-N760-OC-4D
Price	\$299.99
Core clock	1,085MHz
Boost clock	1,150MHz
Memory clock	1,502MHz
Memory interface	256-bit
Memory	4GB GDDR5
3DMark Professional (Fire Strike Extreme)	3058
Graphics Score	3156
Physics Score	10336
Unigine Heaven 4.0	
Score	773
FPS	30.7
POV-Ray 3.7 Beta*	1609.3
Cinebench 11.5**	8.52
Games	(1,920 x 1,200)
Metro: Last Light (4XAA, 16XAF, SSAO off)	43.96fps
Aliens vs. Predator (4XAA, 16XAF)	53.3fps
	(2,560 x 1,600)
Metro: Last Light (4XAA, 16XAF, SSAO off)	27.11fps
Aliens vs. Predator (4XAA, 16XAF)	31.4fps

in both Metro: Last Light and the AvP demo. Even at 2,560 x 1,600, this card still hovers around a playable frame rate.

The GIGABYTE GeForce GTX 760 WINDFORCE OC is a significant graphics upgrade for anyone running a GTX 560- or 460-class GPU. Gamers looking to increase their screen resolution will also appreciate the performance benefits of the larger frame buffer and wider memory bus. ■

BY ANDREW LEIBMAN

Test system specs: Processor: Intel Core i7-4770K; GPU: GIGABYTE GV-N7600C-4GD; RAM: 8GB ADATA XPG V2 DDR3-2400; Storage: 128GB Crucial RealSSD C300; OS: Windows 8 Enterprise (64-bit)

**MaxBron B1000-MB**

\$139.99

LEPA

www.lepausa.com

LEPA MaxBron B1000-MB

LEPA recently released two new series of power supplies, MaxGold and MaxBron. The model we're looking at in this issue is the 1,000W flagship of the MaxBron lineup. The MaxBron B1000-MB is a partially modular, 80 PLUS Bronze-certified power supply that comes with accessories and technology to reduce system noise and minimize the risk of static electricity and shock.

The MaxBron B1000-MB's Anti3s Q-Brick, which is a silicon jelly skin that surrounds the corners and edges of the power supply, helps it stand out from the competition. According to LEPA, the jelly skin does three key things: It reduces shock during transportation, diminishes static electricity, and protects from slips during installation.

At its peak, the MaxBron B1000-MB can reach up to 88% efficiency. To protect your hardware, the PSU has safeguards against overpower, overvoltage, and short circuits. For rail distribution, you'll find a single 12V rail that can handle a maximum load of 83A, which equates to 996 watts of power. Both the 5V and 3.3V rails support up to 24A for a combined power of 130 watts. A 135mm hydraulic bearing fan keeps the power supply cool, and it does so at a near whisper. We found that it was exceptionally quiet during our system testing.

The MaxBron B1000-MB provides plenty of connectivity for those building a high-performance rig. To power motherboards designed for overclocking, the PSU's 4+4-pin and 8-pin CPU power connectors are 23.6 inches long to give you plenty of room to reach CPU power headers at the top of a motherboard. For graphics card support, there are six 12V PCI-E 6+2-pin connectors. The PSU also has 12 SATA, six Molex, and one FDD connector for storage drives, fans, and any other system peripheral you need to power. The only connectors that are hardwired to the unit are the 20+4-pin main power, two 12V CPU connectors, and two 6+2-pin PCI-E connectors.

To give you an idea of performance, we benchmarked the MaxBron B1000-MB on a system featuring an Intel Core i7-4770K, a GIGABYTE GA-Z87X-UD5H motherboard, and two ZOTAC GeForce GTX 580s. We monitored the PSU with an ExTech True RMS Power Analyzer Datalogger and maximized the power by simultaneously running POV-ray 3.7 Beta (stresses all CPU cores) and the Aliens vs. Predator (stresses GPUs) benchmarks. In SLI, the MaxBron B1000-MB displayed a maximum wattage of 680W at a power factor of .968. We also saw a maximum

Specs	LEPA MaxBron B1000-MB
Rated continuous (W)	1,000
12V rails	1
+12V max (A)	83
+5V max (A)	24
+3.3V max (A)	24
SLI/CrossFire-ready	Yes
Max wattage tested	660
Power factor tested	.968
Efficiency rating (as advertised)	Up to 88%
Fan	135mm
PCI-E	6 (6+2-pin)
Main 12V	20+4-pin
8-pin EPS12V	2 (1 4+4-pin, 1 8-pin)
SATA	12
4-pin Molex	6
Floppy	1
Length (including cable bend)	8 inches
Warranty	2 years

voltage of 116.9V and maximum amperage of 6.20A. When running only one GeForce GTX 580, the power supply hit a maximum wattage of 408W and a power factor of .961.

The MaxBron B1000-MB's partially modular design and long CPU power cables make it a good choice for builders who want a clean case interior. The Anti3s Q-Brick also makes this PSU stand out inside a case. ■

BY NATHAN LAKE

LEPA 
Aim for excellence



GM 
MAXGOLD
500w/600w/700w

BM 
MAXBRON
450w/700w/800w/1000w

MX F1
350w/400w/600w

FEEL THE ROAR.

- Hybrid Modular Design for optimal cable management
- "Anti3s Q-Brick design" sleeve protects power supplies from shock, static, and slippage.
- Hydraulic Bearing Fan delivers durable, silent, cooling performance
- Powerful Single +12V Rail for your power-hungry components



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The Capacitor Revolution

Japanese Solid Capacitors Take Over Your Motherboard

Motherboards are a thing of beauty when you think about it. They bring together every other system component, and without a motherboard, those components would be nothing more than a pile of parts. If you consider your PC as an ensemble cast, then the motherboard is your perennial best supporting actor.

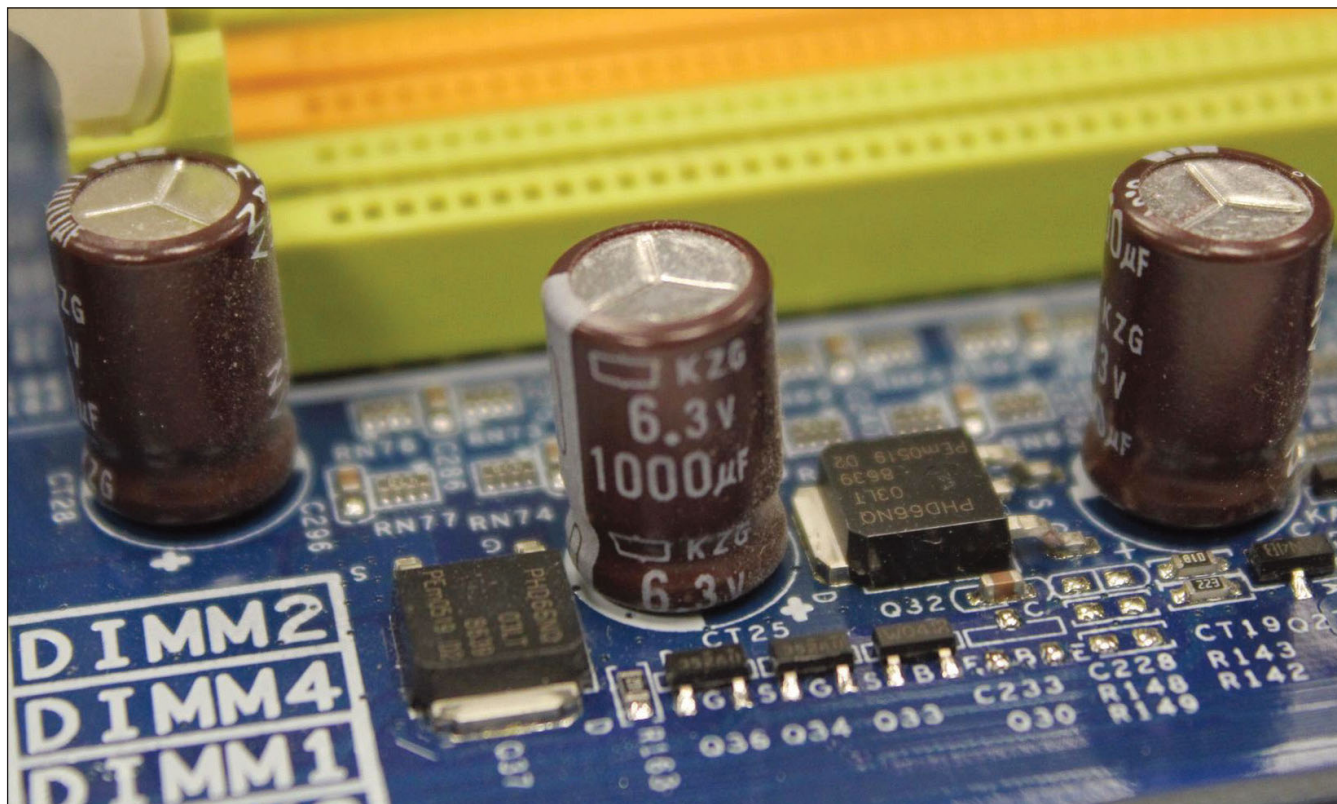
And the motherboard itself has its own support crew; it's stocked with a whole host of unsung heroes. There are plenty of crucial motherboard components that we frequently gloss

over with a "Yeah, yeah, let's get to the good stuff." We need to know certain vital specs, such as processor socket, SLI/CrossFire support, supported memory frequencies, and so forth. What about all the rest—a motherboard's capacitors, chokes, MOSFETs, and integrated controllers (Ethernet, storage, wireless, etc.)? If you haven't paid attention to these pieces of the puzzle yet, maybe we can convince you to start.

Usually, you only notice a capacitor when it fails. And when a capacitor fails, it fails spectacularly. They leak. They

explode. They can leave trails of charred destruction across your motherboard. It's possible to replace capacitors, but the process is annoying at best and can be dangerous. (We're dealing with a component that stores electrical charges.) As a power user, you should want the best of the best, and capacitors are really no exception.

Couple this with the fact that motherboard manufacturers go to great lengths to compete for your power user bucks. It's a competitive, if not cutthroat, market, which is why you see companies



Here's a blast from the past that power user hope don't become a literal blast from the past. A decade ago, capacitors that used a liquid electrolyte were the predominant capacitors used in motherboards. Like motherboards themselves, the majority of these capacitors were manufactured in Taiwan in the interest of minimizing costs. (Japanese-made capacitors are traditionally more expensive.)

advertising anything and everything that might set their SKUs apart, capacitors included. This is the reason why you frequently see Japanese solid capacitors touted as a selling point.

That's all well and good, but knowing that Motherboard A uses Japanese solid caps doesn't do you much good if you've previously referred to capacitors as "those little barrel-looking thingies that do . . . something." We'll give you some basic schooling first, explaining capacitors' role on a motherboard. You also need to know the difference between solid and regular electrolytic capacitors, the two types of capacitors you'll find on a motherboard. And, as you might have guessed by this point, all solid capacitors are not created equal. Japan tends to have a leg up over other countries, notably Taiwan. Along the way, we'll share the sordid tale of how a huge batch of bad capacitors sparked a massive recall and nearly sent the industry into a tailspin; it's arguably one of the reasons Japanese solid capacitors are such a big deal.

Hello, My Name Is Capacitor

We've already given you a pretty fair introduction to our guest of honor. Capacitors are those little barrel-looking thingies that pepper your motherboard. Solid caps are often smaller than traditional electrolytic capacitors.

Capacitors are in one sense the gas tanks of your motherboard. When your power supply pulls current from a wall socket and delivers it to your motherboard, that current isn't piped directly to the rest of your components. Before power reaches certain components, such as the CPU, it makes a stop at the motherboard's capacitors. The capacitor's role, somewhat simply, is to store electrical charge and deliver it when needed (like a gas tank).

The ability to store an electrical charge is called, unsurprisingly, capacitance. Capacitors are measured in farads (named after a fairly smart bloke, British physicist Michael Faraday), where one farad produces a potential difference of one volt when charged with one coulomb. (Not to throw too many electrical units of measurement into an already thick stew,

but a coulomb is the electrical charge produced by one ampere in one second.)

Now, a single farad is quite a bit of electrical charge, and a 1-farad capacitor is much more substantial than what you'll find on a motherboard. These capacitors are measured in varying degrees of microfarads, or μF , where one microfarad equals one millionth of a farad. This amount of stored electrical charge isn't as dangerous as what's lurking in a power supply's capacitors or an old CRT monitor's capacitors, but we don't recommend fiddling with any of them unless you really know what you're doing.

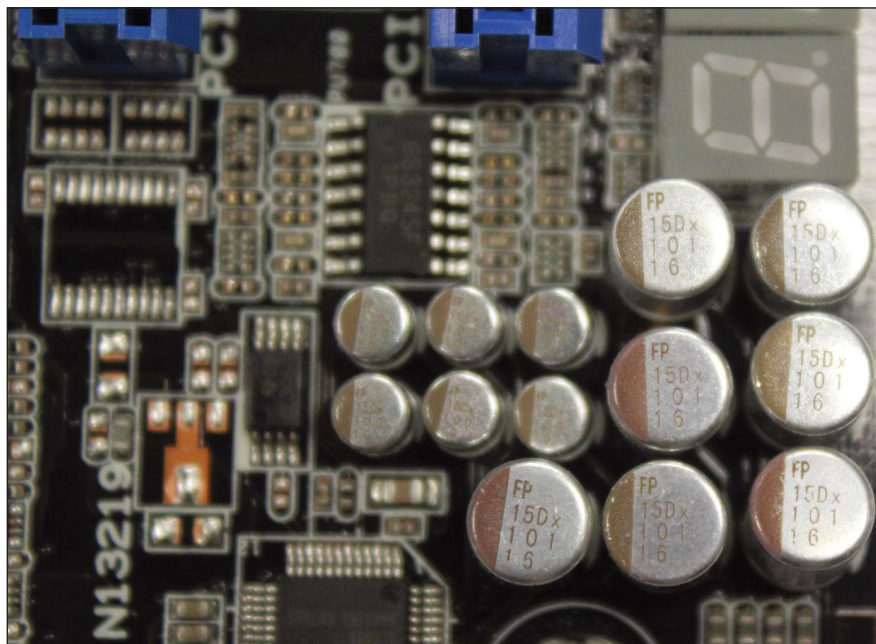
In addition to holding an electrical charge, a motherboard's capacitors also filter the current delivered to components. They help reduce ripple for a smoother current supply. When a capacitor is defective (blown, leaky), its motherboard will start to misbehave because it's no longer receiving appropriate current. As such, capacitors are one of the main culprits when a motherboard fails or falters. You want your capacitors to be reliable, obviously.

Gray's Capacitor Anatomy

Solid and electrolytic capacitors share more similarities than differences. (In fact, solid capacitors are electrolytic, too, but we'll get to that.) Both of these capacitors are classified as aluminum electrolytic capacitors; tantalum electrolytic capacitors also exist and are higher quality, but they're also more expensive than their aluminum counterparts.

Aluminum electrolytic capacitors consist of two strips of wound aluminum, one serving as the cathode and the other as the anode. The anode side is insulated with an extremely thin layer of aluminum oxide, which serves as the dielectric. On the cathode side, there's an air-based oxide layer.

The difference between solid caps and regular electrolytic capacitors lies in the middle. In a regular electrolytic capacitor, you'll find a strip of paper between the layers of aluminum. The paper is soaked in a liquid electrolyte, your first clue to



Eventually, regular electrolytic capacitors gave way to solid capacitors, represented by this happy family. Solid capacitors rely on an electrolyte, too, but it's a solid organic semiconductor, which is how solid caps get their name. On the whole, solid caps last longer and are more stable than standard electrolytic capacitors.

how a regular electrolytic capacitor differs from a solid capacitor.

The solution of liquid electrolyte found within an electrolytic capacitor is interesting, too, because capacitor manufacturers tweak their recipes so that no two companies' solutions are the same. The solutions need to be chemically stable while also having low internal electrical resistance. Cost is an issue, too; when you consider the mountains of capacitors manufacturers churn out, the cost of the electrolyte solution is not negligible.

Solid capacitors are basically self-explanatory. They eschew the liquid electrolyte and instead use an organic semiconductor (or OSCON), which is in a solid state, as the capacitor's electrolyte. Solid capacitors are, generally speaking, more expensive than capacitors that use a liquid electrolyte, but solid caps make up for it in terms of overall quality.

The Great Capacitor Catastrophe

As we've mentioned, motherboard manufacturers that wish to set their wares apart frequently make a point to mention their boards' use of solid capacitors as a selling point. They take on the added expense of using solid caps in hopes that enthusiast builders will see the inclusion as a mark of quality.

However, the inverse is also true. In the past, when motherboard makers relied more heavily on regular electrolytic capacitors, capacitor manufacturers frequently looked for ways to make their caps more cost-effective (or cheaper, depending on your disposition). One particular instance of this played out on a global scale with the kind of skullduggery typically reserved for a John le Carré novel.

Rewind the clock a decade to 2002. Hardware retailers, PC OEMs, and repair shops were suddenly inundated with waves of defective motherboards, way outside of the normal failure rate. It didn't take long to trace the source of these failures to their capacitors. The faulty capacitors were dying prematurely. Under normal operating conditions, electrolytic capacitors should last for well over

When Good Capacitors Go Bad

We pride ourselves on being able to fix our own problems. Sometimes, troubleshooting is a simple process. You notice you forgot to run power cables to your graphics card, facepalm with authority, and connect the cables, and life is good again. If you're going to run into problems, these are the problems you want to have.

Blown, leaky, or otherwise broken capacitors can be tricky to diagnose if you don't know what to look for, because your PC displays symptoms that could be caused by a number of problems. Your motherboard could fail to POST. Your system could behave erratically, freezing sporadically, giving you the dreaded BSOD, or rebooting randomly with no explanation. When a capacitor is involved, these behaviors typically increase over time until your motherboard is toast.

If a capacitor (or several) is to blame for any or all of these symptoms, it's often easy to identify, especially if the capacitors use a liquid electrolyte. With regular electrolytic capacitors, look for crusty brown residue coating any capacitors. This is the capacitor's dried-out electrolyte; you want to replace any capacitors like this immediately. Swollen or leaning capacitors are also problematic.

All capacitors, even those that are flawlessly made, will eventually wear out. The capacitor's electrolyte is a limited resource, and once the electrolyte is expended, the capacitor is effectively kaput. However, capacitors that are free of defects should last well beyond a typical upgrade cycle; your motherboard will be obsolete before its capacitors wear out. In the case of the bad batch of liquid electrolyte that plagued the industry off and on for the better part of a decade, the unstable liquid solution created an excess of hydrogen gas, which caused the capacitors to burst at the top and/or leak from the bottom—a mess in every sense of the word.

Although we've focused primarily on the capacitors that prompted widespread failures and a massive recall or two, we should stress that no manufacturer's capacitors are immune from failure. Sensitive electronics in high-intensity environments break down.

If you're faced with one or more critically injured capacitors, we've found the best place to turn, as is often the case, is YouTube. There are several quality tutorials that walk you step-by-step through procedures for replacing a motherboard's faulty capacitors. Hopefully, it will give your motherboard a new lease on life.

decade, at minimum. The bad batches, which consisted of millions of caps, were giving up the ghost after a couple of years.

The problem affected not only motherboards but also monitors, network switches, A/V equipment, and other types of electronic devices. With defective hardware—check that, expensive defective hardware—affecting big-time companies like Dell, HP, IBM, Intel, Samsung, and Apple, fingers needed to be pointed; blame needed to be assigned. The game, as they say, was afoot.

Eventually the problem was traced back to a particular liquid electrolyte solution found in the capacitors. Put simply, the solution was unstable when it was charged, which caused the capacitors

to burst, spilling the liquid within the capacitors. (For more information, see the “When Good Capacitors Go Bad” sidebar.) Several capacitor manufacturers in Taiwan used the electrolyte solution in their capacitors, and those caps found their way into the previously mentioned components and systems.

What followed makes for fun conversation at the LAN party soda fountain, but we're unaware of any public admissions of wrongdoing; we'll start with a very cautionary “as the story goes.” As the story goes, a scientist working for a Japanese company made off with a top-secret electrolyte formula and escaped to China. We've already mentioned that liquid electrolyte formulas are closely guarded in

the industry, so a more effective formula could theoretically yield a substantial payout on the black market.

At first, the sticky-fingered scientist likely used the formula himself, gaining employment at the Chinese branch of a Taiwanese electrolyte manufacturer. Later, the scientist or another party within the company decided to sell the formula to a different Taiwanese electrolyte producer.

The train went off the rails shortly thereafter, because when the formula was stolen, the thief either copied the formula incorrectly or incompletely. The company that purchased the formula produced the defective electrolyte by the ton, and after that it made its way into millions of capacitors.

The fallout was severe. Major companies—Dell, HP, and Apple—initiated massive, expensive recalls of affected products. Dell alone spent a reported \$300 million to service and replace computers that suffered from the defective capacitors. On the flip side, PC repair businesses made a small fortune fixing broken motherboards and computers.

Still, the debacle left a terrible taste in the mouths of more than a few power users. Decked-out motherboards are expensive, but even those that were covered under warranty or replaced via recall cost users the time and headache associated with shipping parts away and waiting for a replacement to arrive, not to mention suffering through system downtime. For some companies, it became clear that they needed an answer for the angry mob of users demanding reliable hardware.

Japan To The Rescue

Justified or not, the Taiwanese capacitor disaster left a stain on the local industry. Because the tainted capacitors were so widely distributed, it was difficult to trust any company's hardware if it used Taiwanese capacitors. Component manufacturers needed a way to restore buyers' confidence and give them the peace of mind that their hardware wasn't defective.

In many cases, companies went back to Japan, this time legitimately. The extra expense of importing Japanese caps, as well



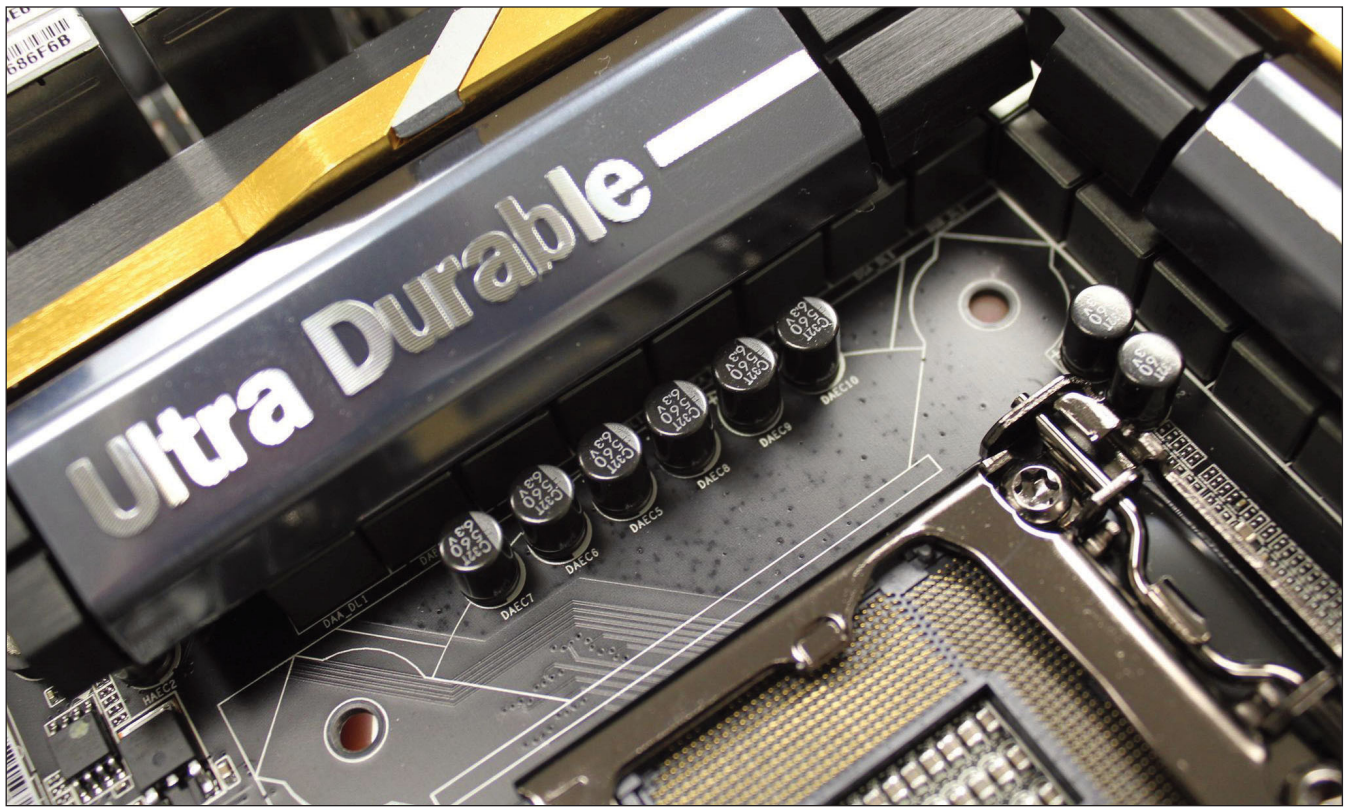
Thanks to a bad batch of liquid electrolyte that blindsided the industry around 2002, capacitor quality can be a selling point for motherboard manufacturers hoping to court demanding buyers. GIGABYTE advertises all Japanese solid caps for the bulk of its boards, including the GA-Z87X-UD5H.

as the initial purchase price, was worth it if it meant hanging onto to existing customers and attracting new buyers.

We can't prove that capacitors produced in Japan are objectively better than those made in Taiwan. At least anecdotally, Japanese capacitors tend to be more expensive (as we've mentioned) than their Taiwanese counterparts. Others suspect that Japanese capacitors are manufactured to higher standards, with more rigorous testing and QA. Because of this, the

perception exists that Japanese caps are higher quality and more dependable.

The "solid" in "Japanese solid capacitors" is really what sets these capacitors apart. Solid caps offer a number of benefits over capacitors that use a liquid electrolyte. The first is overall life span. The primary determining factor of a capacitor's life span is operating temperature. Solid capacitors will outlast regular electrolytic capacitors regardless of temp, but the difference is greater at lower temperatures. For example,



Capacitors produced in Japan are highly sought after because of the perception that Japanese caps are manufactured to more rigorous quality standards. The use of Japanese capacitors in enthusiast hardware isn't limited to motherboards, either. For example, plenty of power supply companies have adopted Japanese capacitors for PSUs, too. All other things equal, PC hardware that uses Japanese solid caps should be superior to hardware that uses regular electrolytic capacitors.

according to GIGABYTE, at 95 degrees Celsius, a electrolytic capacitor should last 4,000 hours, while a solid capacitor should be good for around 6,300 hours. When the operating environment temperature is reduced to 65 C, you extend the life of an electrolytic capacitor to 32,000 hours. Sounds good, but the increase is even more absurd for solid caps: At 65 C, a solid cap will soldier on for an average of 200,000 hours, or 22.8 years nonstop. Yes, you'll be replacing your motherboard before then.

Solid capacitors are also far more tolerant of temperature changes. They exhibit little to no change in capacitance when temperatures fluctuate. Stability and reliability are of the utmost importance with capacitors, more so if overclocking is part of the mix.

Another advantage solid capacitors have over regular electrolytic capacitors is lower impedance at higher frequencies. Impedance, measured in ohms, is the amount of

resistance across a circuit. Similar to fluctuations in temperature, solid capacitors maintain a consistently lower impedance even as frequencies increase. And because temperature increases with impedance, solid capacitor's lower impedance helps them reduce temperatures across the motherboard.

Finally, solid capacitors' lack of a liquid electrolyte prevents them from leaking. Both types of capacitors can rupture (contrary to what some believe, solid capacitors can still burst), but the leaked liquid electrolyte is what's most dangerous. When liquid electrolyte comes in contact with the motherboard, it can cause a short circuit that results in motherboard flambé. Yes, it's possible to replace a leaky capacitor before it can turn your motherboard into a crispy piece of junk, but why bother? You can replace a solid capacitor like you would replace an electrolytic capacitor, and you won't have to worry about leaked electrolyte.

Solid Outlook

Capacitors certainly aren't the first thing power users look for in a motherboard. Still, you can't ignore them, either. Although it's impossibly silly to buy a motherboard, crack open one of its capacitors, and test the electrolyte for stability, motherboard manufacturers have learned their lesson the hard way that capacitor quality counts. No one wants to go through another pandemic of problematic capacitors.

Thankfully, Japanese solid capacitors seem to be the rule rather than the exception on high-quality motherboards. Will Japanese solid caps help you achieve a record-breaking overclock? Will they turn heads at a LAN party? Highly doubtful. But leave that to the rest of your components. When solid capacitors are doing their job—and they should do their job for years on end—you shouldn't even notice them. That's the true advantage of Japanese solid caps. ■

ZALMAN
COOL INNOVATIONS

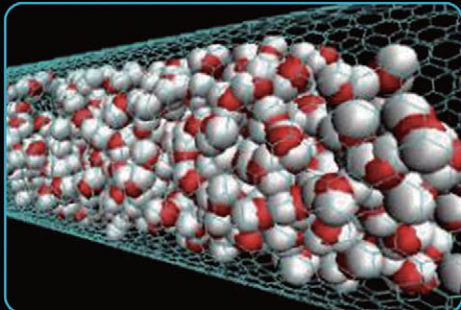


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- Dual radiator designed to maximize the air flow
 - Quadro cooling Heatpipes to optimize heat transfer
 - High-performance built-in water pump to increase flow rate
- Optional 120mm extra fan is available for overclockers



World's First Extreme heat transfer
Nanofluids Technology



Quadro cooling Heatpipes



Pure copper fins
with Black Pearl Nickel Plated



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State-Of-The-Art Standards

ATX

The PC is jam-packed with technical standards, many of which are near and dear to the enthusiast's heart. Blu-ray, PCI-Express, SATA, HDMI, USB, 802.11, GDDR, and Thunderbolt have all played a crucial role in making the modern PC into the incredibly powerful platform that it is, revolutionizing the audio/video experience and letting you navigate the digital world at blazing-fast data rates. But none of those specifications has had a greater impact on the day-to-day experiences of the PC builder than the ATX standard. We'd even go so far as to argue that without the ATX standard's definitions for the I/O panel, mechanical dimensions of components, mounting positions, and power and connector interfaces between the case, motherboard, and PSU, the builder community as we know it would not exist. Modifying a PC, upgrading components, overclocking, and adding bling would all start with a call to the Dells, Apples, and HPs of this hypothetical world. We shutter at the thought. Thankfully, that's not the case, and ATX is largely responsible.

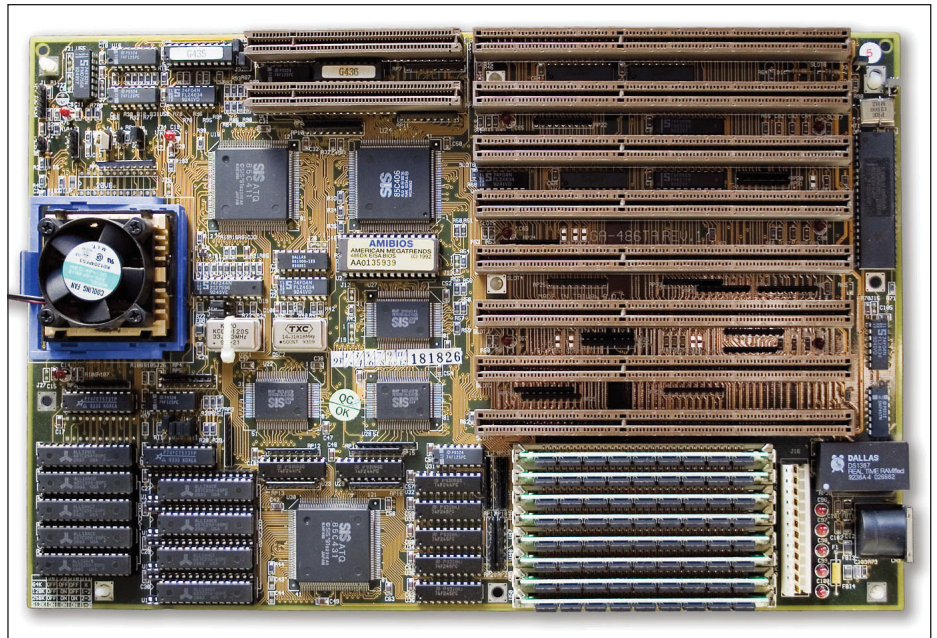
At The Beginning

Prior to the ATX (Advanced Technology eXtended) standard, there was IBM's AT specification, so named because it referred to the dimensions and layout of the motherboard on the IBM AT (Advanced Technology), a personal computer that debuted in 1984. This was a second-generation personal computer, a type 5170, powered by a 6MHz Intel 80286 microprocessor. At the time, many of AT's form factor and technology particulars were backward-compatible with previous PC components and designs. For

instance, AT's 16-bit data and 24-bit address buses supported older 8-bit data and 20-bit address buses from PC-compatible expansion cards, which let self-taught computer builders upgrade systems more easily. As you may recall, the PC's humble beginnings owe a lot to DIY computer clubs from the late '70s and early '80s. Other aspects of AT included a 12- x 13.8-inch motherboard form factor; an 84-key keyboard layout that outlined LED indicators for CAPS LOCK, SCROLL LOCK, and NUM LOCK keys; BIOS-based functions; 5.25-inch floppy drives that could store 1.2MB of data; and a 20MB hard drive with 40ms seek time.

IBM attempted to stem the tide of less expensive IBM compatibles that were

flooding the market by trademarking the name "AT," but it did not succeed. For many builders at the time, the term "AT" came to refer to a common class of PCs that all shared the same motherboard layouts, power supplies, and cases. In 1985, IBM came out with a new standard, called "Baby AT," which featured a narrower motherboard (8.7 x 13 inches). This standard quickly supplanted AT (thereafter referred to as Full AT) and spanned 286 PCs (based on the Intel 80286) up to the early Pentiums and Pentium IIs, which came out between 1993 and 1996. But as often occurs in the world of computing, the old standard quickly started hindering new technologies. New processors that required larger coolers had a tendency to block PCI



This Baby AT-based motherboard size and layout was popular when ATX arrived on the scene.



The I/O backplane of the AT motherboard only included a keyboard port. Other connectors had to run through one of the eight expansion slots.

and ISA slots on Baby AT motherboards. The builders were anxious for change.

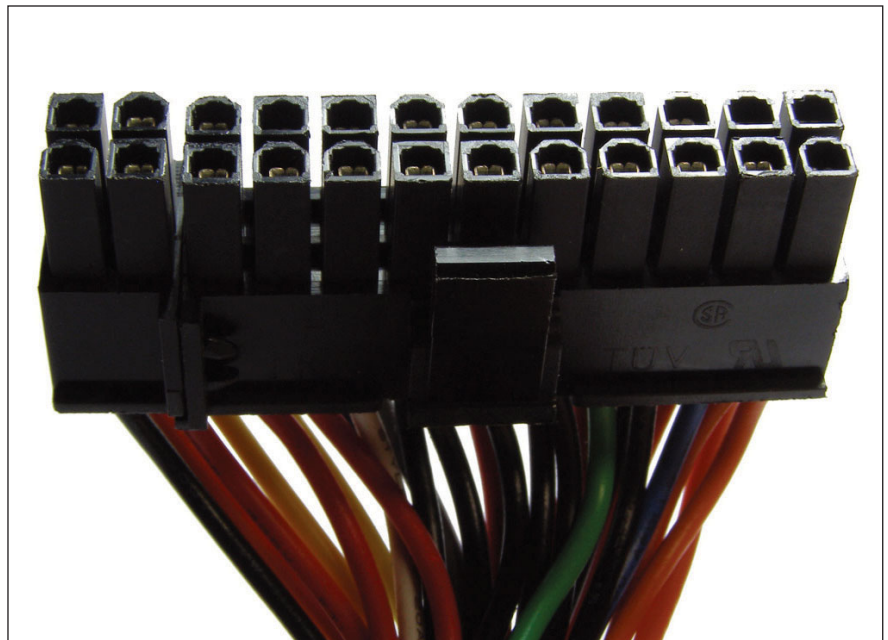
ATX's Ascendancy

In 1995, change came from one of the companies with the most to lose (and the most to gain) from a new standard (or its failure) when Intel introduced ATX. The name gradually took hold throughout the late 1990s as Baby AT adoption flagged and ATX adoption surged; case and power supply manufacturers began designing their products to be compatible with both standards. The biggest differences between ATX and its predecessor were the form factor (12 x 9.6 inches) and its support for seven expansion slots (compared to Baby AT's eight slots).

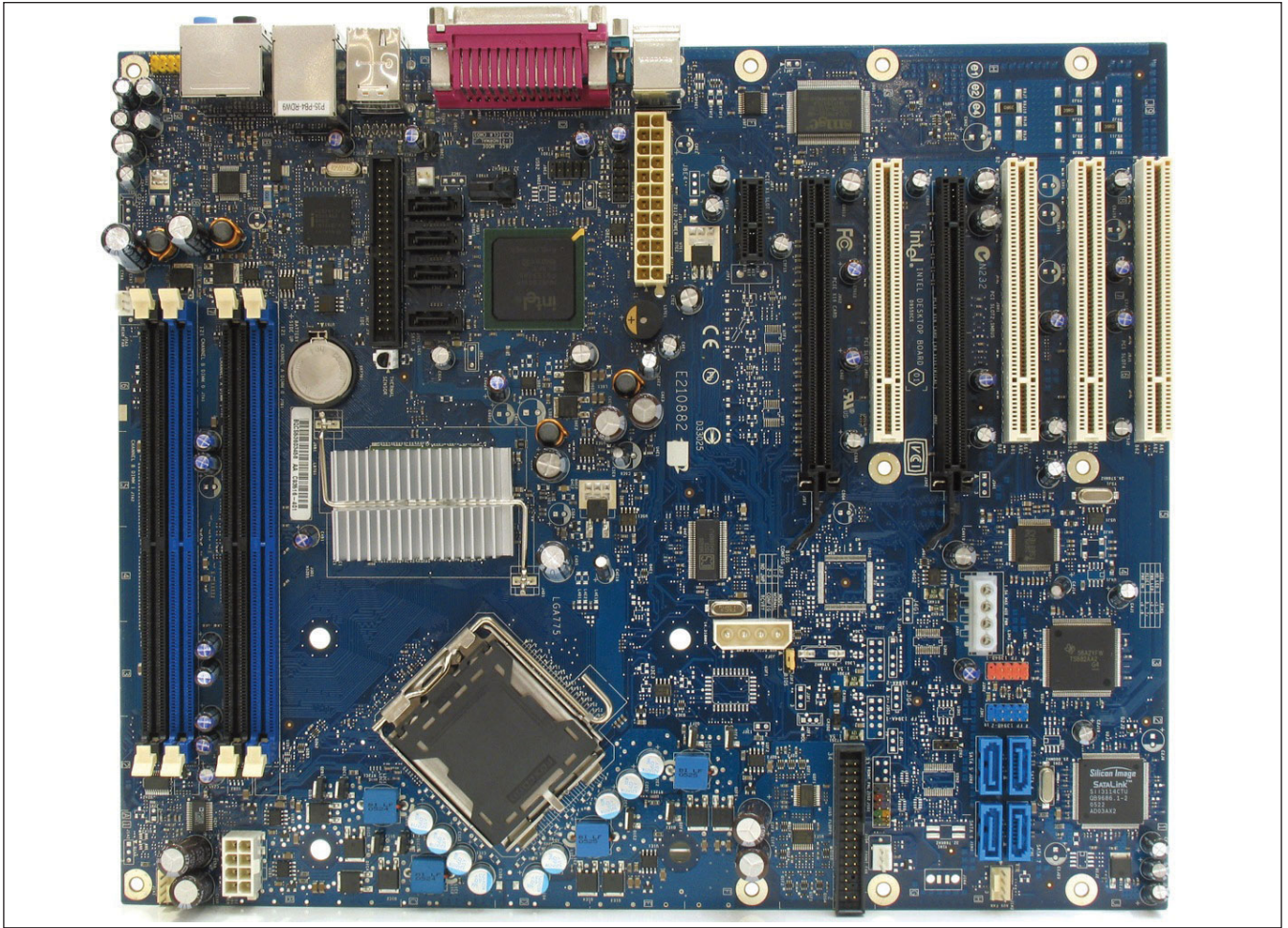
Other changes were made to the power supply pins and connectors, physical ISA bus slots were left out of the ATX standard, and while the AT keyboard connector is similar to the PS/2 connector that ATX calls for, the former uses a 5-pin DIN (Deutsches Institut für Normung, a German standardization organization) connector and the latter uses a 6-pin mini-DIN connector. The 4-pin Molex connector and 4-pin Berg floppy connector (sometimes called mini Molex) were both carryovers from the AT

standard, but the 20-pin Molex Mini-fit Jr. 5566-20A connector, for motherboard power, and the 6-pin auxiliary power connectors (providing a direct line to the PSU's 3.3 volt and/or 5 volt rails) were added

to accommodate components with greater power needs. From ATX's introduction until 2000, ATX's power supply specifications consisted of mostly 3.3- and 5-volt rails for the CPU, RAM, chipset, PCI, AGP, and ISA



The 24-pin ATX power connector was expanded from its 20-pin variant as of ATX12V 2.0.



In late 2004, Intel hoped its BTX (Balanced Technology Extended) form factor would replace ATX, but the specification was scrapped in 2006.

components, and a 12-volt rail for the fans and peripherals, such as hard drives, floppy disk drives, and optical drives.

ATX also dramatically expanded the I/O backplane, making room for dedicated parallel and serial ports (AT-based PCs required brackets to be installed over expansion slots and wired to motherboard headers), audio jacks, USB ports, and more. This lets motherboard manufacturers ship I/O plates customized to the ports on the back of the board that fit into a standardized rectangular window on the back of the case. It also allowed AT boards to fit into ATX cases.

Form Factors

Throughout its long lifespan, the ATX standard has been modified to include

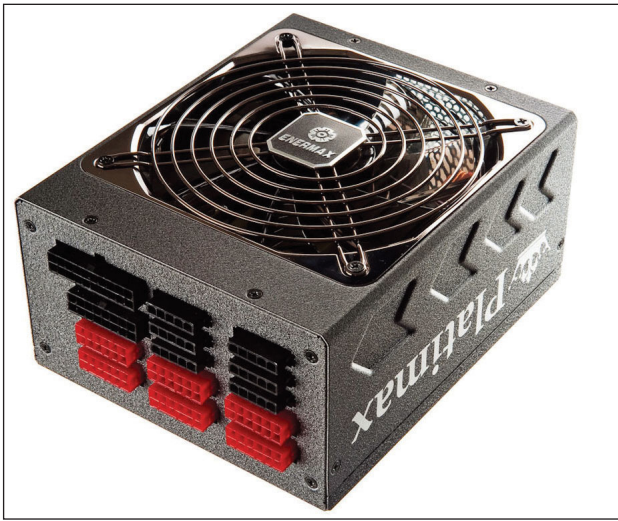
multiple motherboard dimensions. In addition to the Standard ATX form factor, there are MicroATX and Embedded ATX (9.6 x 9.6 inches), Extended ATX (EATX; 12 x 13 inches), FlexATX (9 x 7.5 inches), Mini ATX (11.2 x 8.2 inches), Enhanced Extended ATX (EEATX; 13.7 x 13 inches), and Workstation ATX (WTX; 14 x 16.7 inches). There are also instances where motherboard vendors have created their own variations of the ATX form factor, such as XL-ATX (most recently, 13.6 x 10.4 inches) and HPTX (13.6 x 15 inches).

Power Supply Particulars

The power limits of AT-based systems were a big catalyst for ATX's rapid adoption. In order to make sure ATX had some serious

staying power, Intel made sure its power supply specs could be updated independently of the rest of the standard. Starting in 2000, ATX's power supply saw frequent power line, efficiency, and port updates.

ATX12V 1.x. In February 2000, ATX12V 1.0 was released, which increased the power of the 12-volt rail by adding a 4-pin Molex Mini-Fit Jr. connector to help power the processor. The extra juice became necessary to accommodate Intel's Pentium 4 processors. Despite the fact that AMD Athlon XP and Athlon 64-based systems also required the connector, it was often referred to as a P4 connector. In August, the standard was updated to ATX12V 1.1, which supports more power on the 3.3 volt rail. ATX12V 1.2 came out in January 2002



An 80 PLUS Platinum power supply, like this one from ENERMAX, is rated to be better than 90% efficient at any load.

with the purpose of making the -5-volt rail optional on power supplies, as it was only used on select ISA cards, which were rapidly becoming obsolete. In April 2003, ATX12V 1.3 added slightly more power to the 12-volt rail, defined minimum PSU efficiencies for light and normal loads, outlined required acoustic levels, and added the Serial ATA power connector as an optional component.

ATX12V 2.x. In February 2003, the PSU specifications within ATX got a major

overhaul. ATX12V 2.0 requires that a majority of the computer's power be driven through the 12-volt rails. The spec also added a second 12-volt rail and mandated independent overcurrent protection for each one. The update reduced the 3.3-volt and 5-volt rail power and added a 4-pin power connector to the 20-pin motherboard power connector, designed to deliver an additional 3.3-volt, 5-volt, and 12-volt circuit. The larger motherboard power

connector negated the need for the 6-pin AUX connector, so it was dropped from the specification entirely. Additionally, Serial ATA power connectors were no longer optional. One of the biggest changes to come about in ATX12V 2.0 were the new efficiency requirements; at full, typical, and light loads, the PSU must be 70%, 72%, and 65% efficient, respectively.

In June 2004, Intel introduced ATX12V 2.01, which made a few minor tweaks,

one of which was to scrub the -5-volt rail references from the specification.

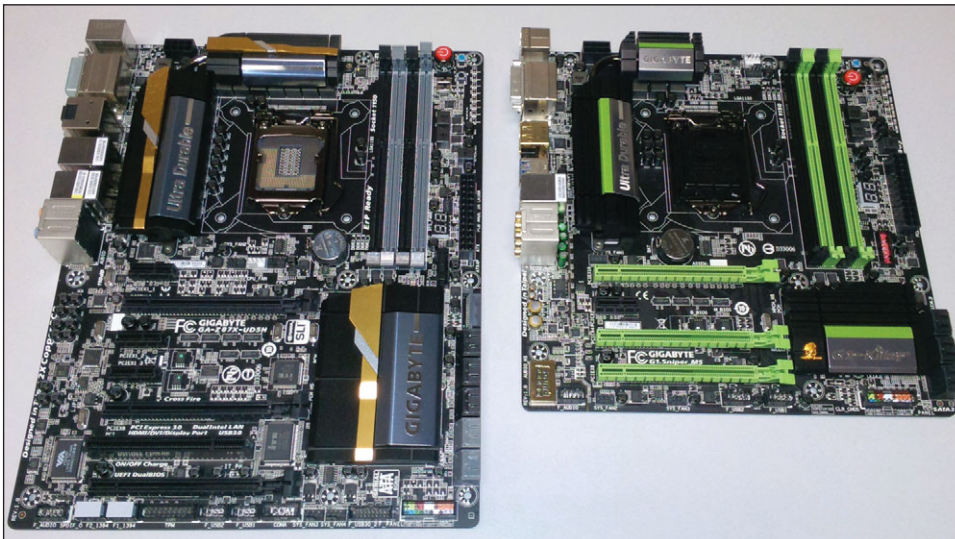
In March 2005, ATX12V 2.1 marginally boosted the power of all rails, tweaked the efficiency requirements, increased the standby current of the 5-volt rail, and defined the typical power distribution for 450-watt PSUs. ATX12V 2.2, which Intel announced at approximately the same time as the 2.1 update, corrected some parts of the previous release and specified High Current Series wire terminals for ATX Main Power, the +12-volt power connector, and the 24-pin main and 4-pin +12-volt power connectors.

The current revision, dubbed ATX12V 2.3, came out in March 2007. It raised the recommended PSU efficiency to 80% (70% minimum), bringing computers into compliance with Energy Star 4.0 mandates. This revision also decreased the 12-volt minimum load requirement, which lets PSUs run modern processors with very low power consumption during startup. Another enthusiast-friendly update is the removal of the absolute overcurrent limit of 240 volt/amps per rail, which lets 12-volt lines deliver more than 20 amps per rail; which is practically mandatory for PCs running high-end components.

Since the 2.3 revision, Intel has tweaked it a few more times, but as we went to press the firm had yet to announce anything significant, such as an ATX12V 2.4 revision.

The Ultimate Standard

It won't make your media look or sound any better; won't supercharge data transfers across buses, cables, or wireless connections; and it won't eliminate bottlenecks like all the other technologies we've covered in "State-Of-The-Art Standards." But ATX, more than all the rest, has made it possible for anyone, regardless of skill or previous experience, to build a PC from various parts (mistakes notwithstanding). Indeed, any standard that can stick around for nearly two decades in this industry deserves some serious props. ATX, we heart you. ■



The two most popular motherboard form factors are Standard ATX (left) and microATX (right).

Quad-Core Cubed

We Peek Inside The CuBox-i



The first 1GHz desktop processors are over 13 years old. Take a moment to think about that—13 years. Some of you might not have even been alive when AMD and Intel released the Athlon 1000 and Pentium III 1000, respectively.

Back then, these processors made their homes in big, colossal towers (then available in stunning beige). They were the turn-of-the-millennium equivalent of an Extreme Edition or FX series CPU, true power-user silicon. Both were fabbed using a 180nm lithography—downright flabby by today's standards.

Thankfully, gloriously, we've come a long way since then. With advances to processor architectures and lithography, we have chips that are faster, cheaper, and more efficient, pound for pound. CPUs that used to require huge coolers now require almost nothing at all. This is the primary reason behind the explosion of USFF (uber small form factor, CPU trademark pending) PCs hitting the market. They're fun, fierce, and freakishly small.

And the family of powerful little PCs keeps growing. The upcoming CuBox-i from developer SolidRun is six sides of intriguing. Measuring about 7.77 cubic inches, the CuBox-i is a fanless enclosure that can hold up to a quad-core 1GHz SoC. Grab your magnifying glass and come along as we take a look at what's under the hood of this micro machine.

Solid Start

Maybe you haven't noticed, but single-board computers are kind of a thing right now. If you've ever been in the market

for one, you know that researching one model leads you down a rabbit hole where five or six more are clamoring for your attention. We should know: we covered five of 'em in the August 2013 issue, in addition to our Raspberry Pi feature in the March 2013 issue.

Several of these boards have received a lot of press elsewhere, whether it's because of their Kickstarter notoriety (as in the case of the UDOO and Adapteva Parallella) or the nobility of their mission statement (such as the Raspberry Pi's goal of teaching kids to code). You might think of SolidRun's CuBox as a me-too product hoping to ride the wave of popularity other ultra-small computers have enjoyed, but the CuBox is actually older than many of its peers.

The magic of the CuBox unfolded two years ago when SolidRun announced the original CuBox in April 2011. Founder and CEO Kossay Omary recognized the promise a small, energy-efficient, open-source PC held. "The world needs more low-power, less-wasteful devices to

do all kinds of tasks," he said. SolidRun's lofty ambition: "to be the leading provider of miniature computing solutions by offering innovative, small, energy-efficient yet powerful open-source alternatives to today's larger form factor computers, IPTV set-top boxes, and thin clients."

That alternative, the palm-sized CuBox was ready to go in December 2011. The original CuBox relied on a Marvell Armada 510 SoC, which consists of an 800MHz ARM processor, OpenGL ES 2.0 GPU, and a video engine capable of decoding 1080p video. The CuBox also included 1GB of DDR3, Gigabit Ethernet, two USB 2.0 ports, and an optical S/PDIF output, among other features.

The CuBox also gave developers and enthusiasts access to a variety of open-source tools. It was capable of running Android 2.2 and Linux kernel 2.6 (Ubuntu and Debian distros), as well as XBMC. Two versions of the original CuBox were available for \$119.99 and \$159.99, making them relatively



Although it wasn't available for pre-order at press time, SolidRun's CuBox-i website teases visitors with a look at the CuBox-i in a bright red case. An official response on the site's forum to questions about availability said that there was "no official answer" as yet.

accessible for anyone who wanted to have a portable platform for easy tinkering.

CuBox, Son Of CuBox

Building on the success of the original CuBox, SolidRun came back with . . . another CuBox. The latest model is actually an entire family—the CuBox-i series. There are four versions of the CuBox-i, ranging from the extremely affordable to the dangerously powerful. On one end of the scale, we have the CuBox-i1, a single-core system that compares favorably to the original CuBox. The big difference here is that the CuBox-i1 sells for \$44.99, less than half the price of the original CuBox, making it even more affordable for open-source fans and HTPC nuts.

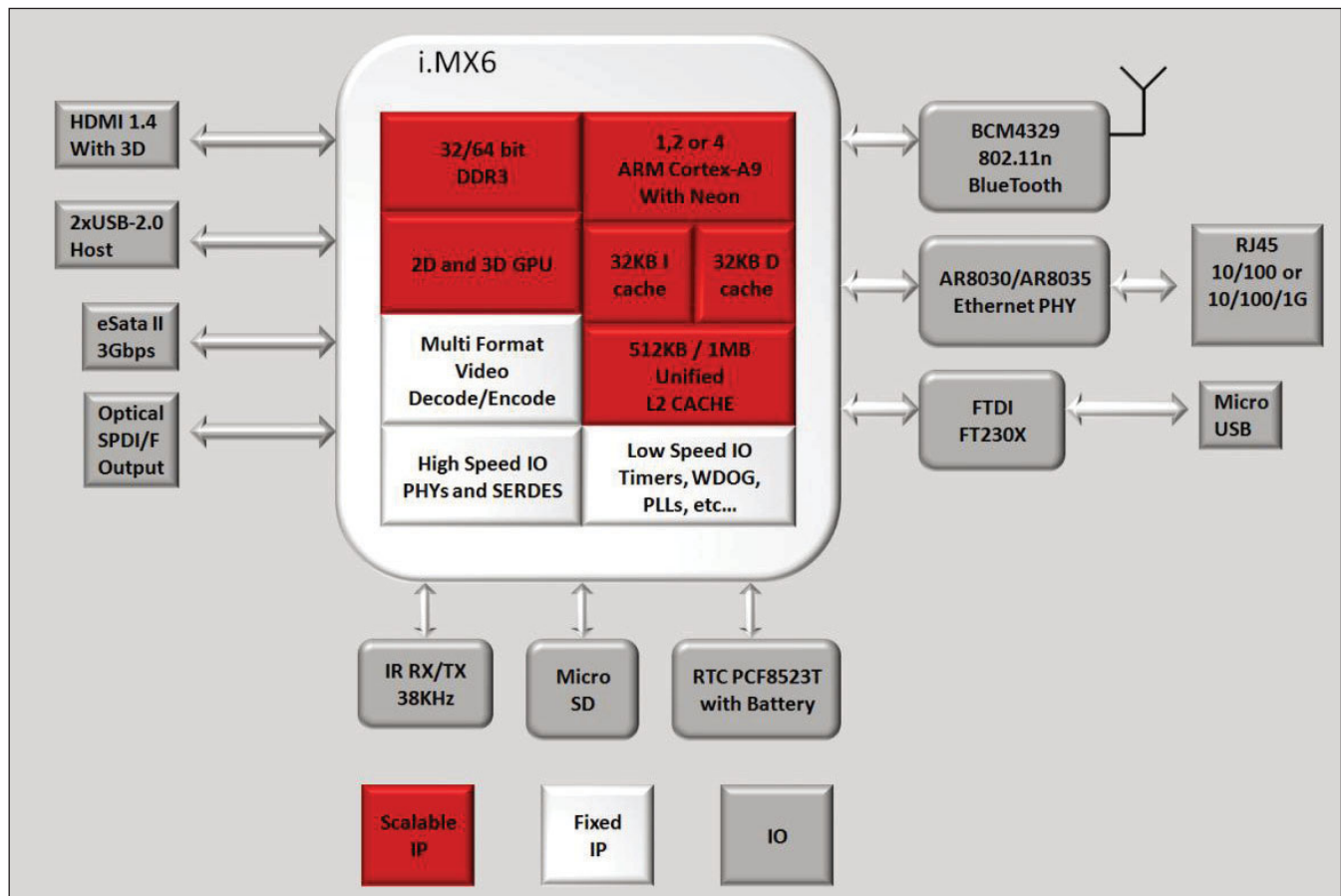


The CuBox may not have received as much ink as some other single-board computing projects, such as the Raspberry Pi or UDOO, but the CuBox-i is actually a second-generation product family.

On the opposite end, the CuBox-i4Pro has to be one of the most powerful computers per cubic inch that we've ever run across. It uses a Freescale i.MX6 SoC just like the rest of the CuBox-i boxes, but as the name

teases, the CuBox-i4Pro brings four times the pain as the CuBox-i1: There are four 1GHz cores doing work in the CuBox-i4Pro, compared to a single 1GHz core in the CuBox-i1. The i.MX6 series is based on ARM's Cortex A9 architecture.

Elsewhere, the CuBox-i4Pro (\$119.99, the price of the original CuBox base model) represents the progress SolidRun has made over two years, barely altering the CuBox's form factor. In addition to the quad-core i.MX6, the CuBox-i4Pro has 2GB of DDR3-1066. The integrated GC2000 GPU is capable of OpenGL ES 1.1/2.0 and OpenCL 1.1E, and the built-in video decoder is slightly upgraded over the original CuBox's. The CuBox-i4Pro



Freescale's i.MX6 system on a chip is largely responsible for helping the CuBox-i earn its keep. The heart of the i.MX6 is ARM's Cortex A9 processor, which hums along at a respectable 1GHz. The base model CuBox-i1 has a single-core design, while the flagship CuBox-i4Pro is a quad-core behemoth. The other two CuBox-i models boast dual-core chips. Like the original CuBox's Marvel Armada 510 SoC, the i.MX6 also has the following goodies: Gigabit Ethernet, two USB ports, and S/PDIF output.

supports the HDMI 1.4 standard, which includes 3D.

For network connectivity, the CuBox-i4Pro gives you the choice of wired or wireless. Gigabit Ethernet is back for an encore, and it brought 802.11n/Bluetooth support with it. This further establishes the CuBox-i4Pro's HTPC bona fides. It also has an IR receiver and transmitter (38kHz) for use with a remote control.

The CuBox-i4Pro also has two USB 2.0 ports, an eSATA 3Gbps port, and a microSD slot (the latter used for booting various OSes). Finally, the new CuBox-i has a micro USB port that you can use to connect a micro-USB-to-RS232 cable for debugging purposes.

Open-Source Muscle

Power users who are familiar with the single-board computer game are well aware of the CuBox's potential with open-source software. If this is your first look, though, know that the CuBox offers options aplenty for someone interested in Linux and/or Android projects.

One of the most alluring advantages the CuBox-i offers is its support for XBMC (xbmc.org), which is carried over from the original CuBox. XBMC is an ultra-slick media player that's capable of playing virtually every popular audio and video format. It's skinnable and customizable, and there is a veritable buffet of add-ons that will extend its functionality even further. If your goal with the CuBox-i is creating an almost zero-footprint HTPC, XBMC is practically all you need.

Now, if you'd rather use your CuBox-i more as a computer connected to your TV rather than strictly as an HTPC, you might want to roll with Android. If you opt to include a microSD card when buying a CuBox-i, the card will include Android 4.2.2 Jelly Bean. With the CuBox-i hooked up to your TV and Android hooked up to an Internet connection, you've basically converted your set to a smart TV. Connect a wireless keyboard and mouse through the CuBox-i's USB ports and blast off.

And the CuBox-i still runs "just" Linux, if you want. Ubuntu and Debian

CuBox-i, I See You

CuBox-i Specs	CuBox-i1	CuBox-i2	CuBox-i2Ultra	CuBox-i4Pro
Chipset	i.MX6 Solo	i.MX6 Dual Lite	i.MX6 Dual	i.MX6 Quad
Core count	1 @ 1GHz	2 @ 1GHz	2 @ 1GHz	4 @ 1GHz
Memory size	512MB DDR3	1GB DDR3	1GB DDR3	2GB DDR3
Memory config	32-bit, 800Mbps	64-bit, 800Mbps	64-bit, 1,066Mbps	64-bit, 1,066Mbps
3D GPU	GC880	GC880	GC2000	GC2000
3D GPU type	OpenGL ES 1.1/2.0	OpenGL ES 1.1/2.0	OpenGL ES 1.1/2.0, OpenCL 1.1E	OpenGL ES 1.1/2.0, OpenCL 1.1E
HDMI	1.4, 3D support	1.4, 3D Support	1.4, 3D Support	1.4, 3D Support
Ethernet	10/100	10/100	10/100/1,000	10/100/1,000
USB 2.0	2	2	2	2
802.11n/Bluetooth	Optional	Optional	Yes	Yes
MicroSD slot	1	1	1	1
eSATA 3Gbps	No	No	Yes	Yes
Optical S/PDIF output	Yes	Yes	Yes	Yes
Micro USB to RS-232	No	No	Yes	Yes
Infrared	Receiver	Receiver	Receiver and transmitter	Receiver and transmitter
Price	\$44.99	\$69.99	\$94.99	\$119.99

might be the most popular distros to run on the box. SolidRun also encourages users to go wild with their own projects, as the CuBox-i is suitable for coding and compiling Python and Perl, for example, and running IDEs. Using the CuBox-i for OpenCL 1.1 GPGPU image processing is another possibility.

The Box That Rocks

Considering that SolidRun has doubled the number of CuBox models

from two to four between generations, interested power users now have even more options for buying a CuBox. Maybe you want a ridiculously inexpensive way to play around with Linux, learn programming, or add some brains to your TV. Perhaps you're interested in a mini PC with maximum firepower. Whatever the reason, we think the CuBox-i is six sides of awesome. ■

UrbanSeries

Simple, Yet Elegant

HARD HAT AREA
PC MODDER
MAD READER MOD



N7 Armor

If you've spent much time playing any of the games in BioWare's highly entertaining Mass Effect trilogy, this month's Mad Reader Mod will likely be instantly recognizable. Kevin Johnson, who says that many of the ideas he has for mods are inspired by videogames, wanted to build an enthusiast-level gaming PC that resembled Commander Shepard's N7 special forces armor.

"I was inspired to do this mod right before Mass Effect 3 was released," Johnson says. "Unfortunately, it wouldn't be until I had already beaten the game before I completed the build."

The Process

Johnson says he spent about 60 hours on N7 Armor. He painted the exterior of his NZXT Switch 810 with Rust-Oleum Dark Steel, painted the distinctive red and white stripes along the top and front of the case, and painted the fan grilles red and white to match. He added the N7 logo, which appears on much of the armor you can put on Shepard in the trilogy (especially in Mass Effect 2 and Mass Effect 3), and which signifies the highest achievable rank of Systems Alliance Special Forces. He also painted many of the interior surfaces satin black.

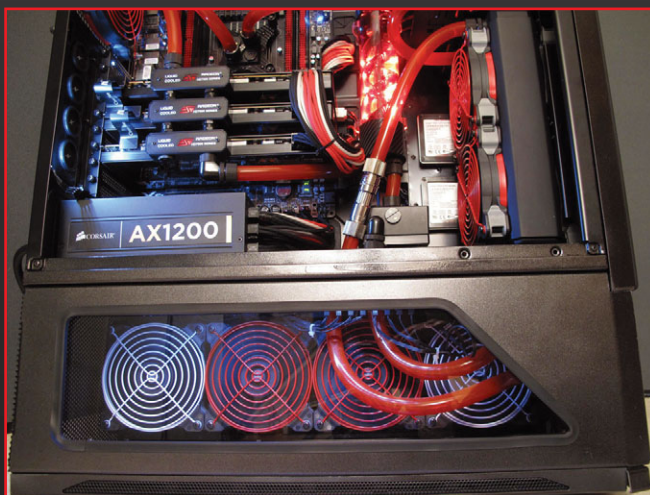
Johnson didn't stop at paint, however. As you can see, he individually sleeved all of the power cables in red, white, and

black, as well, so that the N7 theme carries throughout the mod. The cooling loop tubing and the heat spreaders on N7 Armor's memory modules also match the N7 red. Then he removed the case's stock window and added a custom acrylic window of his own. Johnson applied carbon fiber vinyl wrap to the top and front panels, the graphics card backplates, the ends of his FrozenQ cylindrical reservoir, his XSPC D5 Dual Bay reservoir, and the top of his CPU waterblock.

Although he managed to fit a 2X radiator and a 3X rad inside the case, Johnson contracted a CNC milling firm to build a custom pedestal for the big 4X radiator that he attached to the bottom of the case. He painted the exterior of the pedestal with the same Dark Steel paint as the case, painted the interior satin black, and covered the front with carbon fiber wrap, so that it looks like a natural extension of the Switch 810.

The Parts

Aside from its Switch 810, the N7 Armor consists of an Intel Core i7-3930K running on an MSI Big Bang-XPowr II motherboard, 16GB of Corsair Dominator GT memory, three MSI Radeon HD 7970 graphics cards, a Corsair AX1200 power supply, and a pair of 240GB Intel 520 Series SSDs in RAID 0.



The rig's cooling system includes the aforementioned FrozenQ Helix reservoir and an XSPC D5 Dual Bay reservoir, as well as a Swiftech Apogee HD CPU waterblock, Swiftech Komodo HD7900 Series waterblocks for the GPUs, three Black Ice SR1 radiators (a 240, a 360, and a 480), 18 Corsair SP120 case fans, two Corsair AF140 fans, and a Lamptron FC-9 fan control unit.

First Time, Long Time

Oh yeah, remember how we mentioned that Johnson has several mod ideas based on games? Well, you wouldn't know it to look at N7 Armor, but he hasn't built any of the others yet—this is his first “attempt” at a PC mod. Pretty impressive!

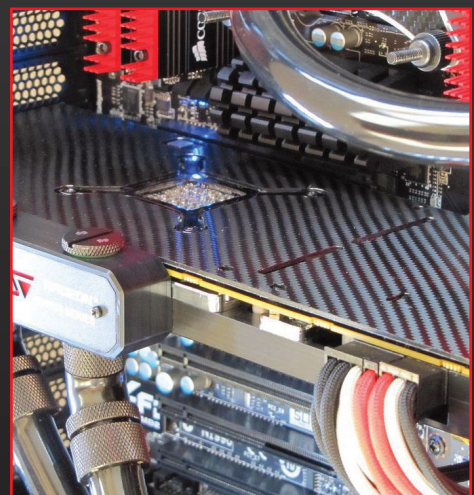
When we asked Johnson what he plans to do next, he mentioned another Switch 810 mod based on the Mass Effect universe, only this time instead of a Shepard theme, he'd like to do one for Asari researcher Liara T'Soni. We're guessing there will be a little more blue involved in that one. ■

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. If we include your system in our “Mad Reader Mod” section, we'll send you a cash prize and a one-year subscription to *CPU*. (U.S. residents only, please.)



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PAX Prime 2013

A Gaming Culture Explosion

Seattle's Penny Arcade Expo is a spectacle of foam weaponry, nerdcore rap and chiptune soundtracks, gaming jokes, walking-talking memes, and all manner of games—board, card, and video. But beyond that, PAX is also a place where cosplayers dressed as their favorite characters and creatures from movies, television, and, of course, games rub elbows with YouTube celebrities, game designers, and the regular (and irregular) Jims and Janets off the street who are attracted to the one-of-a-kind atmosphere. If you listen closely to any of the multitude of conversations happening all around, you'll even pick up on the coded language that is wholly informed by a deep love of games, science fiction, fantasy, and every imaginable creative endeavor. It's a truly cultural movement rooted in the rich history of games and media, and it's unlike anything you've ever seen.



As in years past, *CPU* refilled our heart containers, crafted a few diamond pickaxes, and brought along a couple thousand issues of the magazine to hand out to passersby. Turns out all those Master Chiefs, Links, and Chun Lis dig PCs just about as much as we do.



Our booth was on the fourth floor in one of the two massive halls that made up the main floor of the show; even more booths filled the ballrooms on the sixth floor. The majority of the convention space was consumed by companies in the gaming industry.



We spent a lot of our time at *CPU*'s booth, meeting veteran readers and introducing ourselves to the uninitiated, but we also found some time to head to Intel's BYOC LAN party and PC Freeplay areas in the Annex. Intel once again brought along approximately 300 gaming machines and let attendees take a crack at a handful of popular PC games.

A Place For The PC

Despite being a largely gaming convention, PAX welcomed a host of PC hardware manufacturers, including MSI, NVIDIA, SteelSeries, Turtle Beach, Kingston, Logitech, and more.

Anyone who stopped by the Corsair booth was treated to a hands-on of the company's latest gaming peripherals, including the Vengeance 2100 wireless gaming headset, Vengeance 1500 USB gaming headset, Vengeance 1400 analog gaming headset, as well as two new headsets under the Raptor brand, the HS40 and HS30. Corsair also showed off the Raptor K30 gaming keyboard and two new Corsair gaming mouse mats.

At Intel's booth, we were wowed with the new Haswell-based NUC (Next Unit of Computing) device, which packs a barebones PC into a case that's roughly 4 inches square and about 2 inches tall. The unit running the Intel Core i5-4250U processor was able to render a 1080p demo of GRID 2 at better than 30 frames per second. Not bad for a computer you could hide behind a wireless router.



Sure, it's been done before, but that doesn't mean we get tired of seeing it. The iconic NES 8-bit console was a household staple for the better part of a decade, and it lives on here as a compact PC.



At Cooler Master's booth, we got a glimpse of the impressive HAF Stack, a modular case that lets builders mix and match three cases in a number of ways to accommodate liquid or air cooling, small and standard form factor components, and multiple PCs in a single space.



PAX prides itself on maintaining a family-friendly environment, and that's readily apparent here, as some future professional gamers take a few minutes to try out a sampling of cutting-edge hardware. Booths like this one were commonplace throughout the event.

A Modders Meetup

PC modding stole the show both at Intel's LAN party and on the show floor. We saw a handful of familiar faces as well, including modders Lee Harrington, Anthony Lackey, Bob Stewart, Rod Rosenberg, Jon Hansz, Ron Lee Christianson, Charles Falcone, Richard Surroz, and more. PDXLAN coordinator Matt "Vector" Conwell also dropped by the booth to say "hello." CPU also held a mod contest at the show, and Anthony "Elmy" Lackey's chrome-piped White Lightning mod walked away with the first prize.



Looking for a white on white mod? White Lightning has it in spades. Some of the highlights include 20 ENERMAX white CLUSTER Advance fans, ADATA SSDs, an ASUS SABERTOOTH motherboard, an EK waterblock for White Lightning's Radeon HD 7990, chromed XSPC rads, Bitspower fittings, and more.



Jon "Pennywise" Hansz's ACIDBURN mod took home second-place honors, and deservedly so. If ACIDBURN looks familiar, that's because Hansz's mod was the runner-up at another *CPU* mod contest this summer, PDXLAN 22.



Normally, we're impressed when a modder manages to stuff one liquid-cooling loop in a small midtower. Our third place winner managed to cram two inside this fully customized Lian Li case.

Customus Prime, Roll Out!

Throughout the show, we handed out tickets to our Monday drawing for the CPU System Workshop's Customus Prime from the September issue. This system features Intel's Core i7-4770K, an ENERMAX ETS-T40-BK CPU cooler, GIGABYTE G1.Sniper 5, 16GB of Corsair DDR3-1866 memory, MSI's GeForce GTX 770 Twin Frozr graphics card, and a 256GB OCZ Vector SSD. Cooler Master supplied the PSU, a fully modular V1000, and Thermaltake stepped up with the Urban S71 enclosure, a MEKA G-Unit Illuminated Edition keyboard, and THERON Infrared mouse. We'd like to believe that the unprecedented traffic to our booth could be solely attributed to our sparkling personalities, but getting a chance to win such a sweet rig may have been a factor.



Congratulations to Leilani A., who goes home with a brand-new custom PC that any power user would be lucky to have.

On Monday at about 2:30 in the afternoon, we drew a ticket, surprising aspiring artist Leilani A. with a new high-performance PC. But she and her dad Eric had a surprise for us too: That day was Leilani's 12th birthday. After some of the excitement died down, Eric confided that the system was going to be put to good use. Leilani's grandmother had giving her some digital art software and accessories for her birthday, but their current PC wasn't powerful enough to run them. Now, Leilani has a system that's practically purpose-built for content creation. We'd like to extend a hearty "Thank you!" to Intel, GIGABYTE, MSI, Corsair, ENERMAX, OCZ, Cooler Master, and Thermaltake for helping us make this a very special birthday for Leilani and her family.

This was the last system giveaway of the year, but we've got another quartet of system builds planned for next year, so come out and see us at PDXLAN, QuakeCon, PAX East, or PAX Prime next year. Better yet, just make plans to attend each one. ■



Living out of your suitcase is one thing; gaming out of it is, clearly, quite another. Like the NES mod shown earlier, we always enjoy seeing creative modders repurpose everyday objects as their case mods. It helps, too, that this particular mod travels well.

Intel LANFest Colorado

Sleepless In Loveland

Each year in Loveland, Colo., one of the coolest Intel LANFest events we've been to takes place at The Ranch Events Complex. LANFest Colorado is a 45-minute drive north of Denver and is held in a great facility and run by an excellent team of coordinators.

This year's 250-plus-seat event was held September 7 and 8, starting at 10 a.m. on Saturday and wrapping with the prize giveaway at around 8 p.m. the following night. The LAN included scheduled tournaments for StarCraft II, League of Legends, Battlefield 3, and Counter-Strike: Global Offensive, plus a mammoth pizza feed on Saturday night, a Monster Chug contest, and much more.

As usual, the LAN also featured an overclocking demonstration led by Intel Principal Engineer Eric Fetzer. This time the demo compared interesting cooling setups on three Haswell-based system configs equipped with a Xeon Phi coprocessor unit. The first test ran stock cooling and fans, while the second consisted of a Corsair H100i liquid-cooling unit and a CPU without its integrated heat spreader. The guys experimented with several interface materials between the die and the cooler, including indium foil, vertical carbon, and others, as well as two commercially available thermal pastes. For the third config, in addition to removing the CPU's metal "lid," the team thinned the CPU die from 800µm to 50µm to improve thermal conductivity and milled a special heat spreader for its connection to the H100i.



Before . . .



After!



Sometime in wee hours of the night, a Tetris tournament broke out.



Wait, what?

HARD HAT AREA

PC MODDER



Most people use the phrase "a truckload of pizza" metaphorically.



No LANFest event would be complete without a mountain of swag.



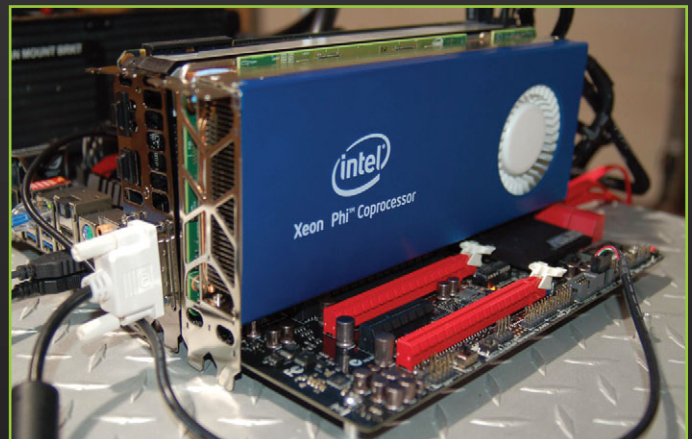
Ever played Rock Paper Scissors for a copy of Quake Wars? These guys have.



We're sure that chugging a can of Monster is in no way harmful to one's health. At least one or two of them got the Lo-Carb. Maybe.



LANFest admin Jed Penna and his son Seth shared a table for the second straight year.



Your USB Lifeline

Make A Windows 8 Installation Flash Drive

It's time to reinstall your operating system. There are many benefits to performing a nuke and pave, whether you're looking for the fresh install performance boost or a particularly stubborn error is forcing your hand. But the traditional method of reinstalling using a disc is outmoded; read on for a guide to creating a USB Windows 8 installation drive.

The Flash Drive Fix

Once the install process launches, you'd be hard pressed to tell the difference between running the installation from the disc and a USB drive. In the latter case, there's a distinct lack of whirring coming from your optical drive, but otherwise the processes are fairly identical. Having your install files on a USB drive is useful for those instances when your PC doesn't have an installed optical drive. A USB drive is also a lot more portable than a 12cm disc, and having the files readily accessible make it easier to slipstream updates to the install files.



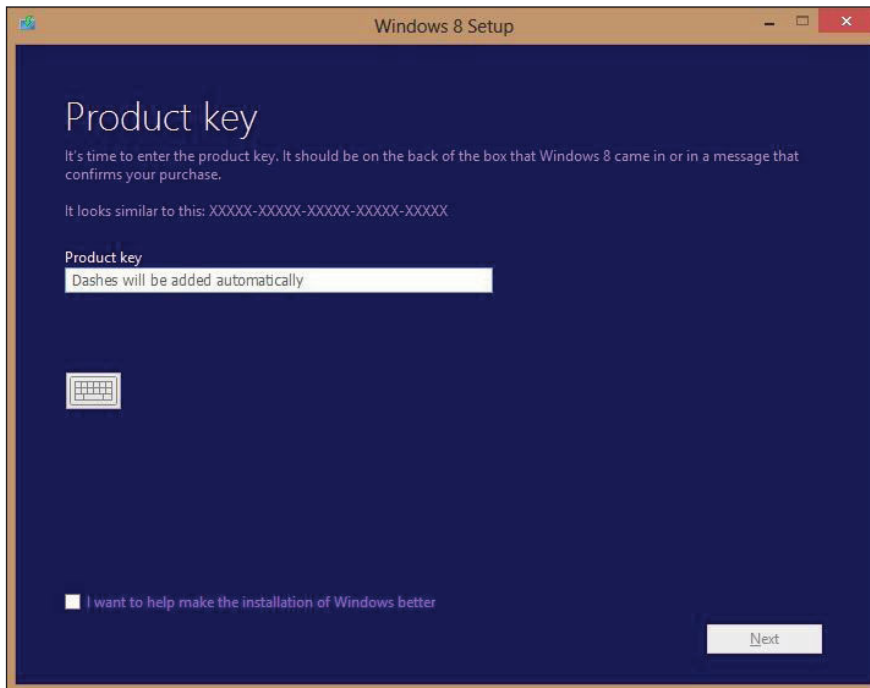
Over the next few pages, we'll cover two methods for creating a bootable USB drive from which you can install Windows 8. The first option we'll cover comes from Microsoft and doesn't

require any disc media whatsoever. The second method requires a Windows 8 disc and a couple utilities that let you save the installation files as an ISO image file and transfer it to a bootable USB drive.

A USB drive is also a lot more portable than a 12cm disc, and having the files readily accessible make it easier to slipstream updates to the install files.

Get Windows 8

The first step for both processes involves obtaining a legitimate copy of Windows 8 with a product key. To use the Microsoft method, you'll need a full retail copy of the OS: You won't be able to create a USB installation drive using the first method if your Windows 8 came preinstalled with your PC or you only have an OEM disc. Early in the Microsoft method process, you're required to input a product key to determine if the license you purchased (OEM or retail) supports a USB-based install. If your key is from an OEM copy of the OS, it'll prevent you from proceeding. One of the reasons we



Your Windows 8 product key is a necessary ingredient for installing the OS from a USB drive.

like the Microsoft method is because you can download the installation files from the web.

To proceed with this method, you'll need to find a computer that has an active broadband Internet connection and a USB port. You can use a Win8, Win7, Vista, or WinXP SP3 computer to create the drive, but remember that this does not necessarily have to be the computer you plan to install Windows 8 on. Also note that if you want the USB drive to install a 64-bit or 32-bit copy of Windows 8, then perform this operation using a PC running a corresponding 64- or 32-bit version of Microsoft's OS. The language settings of the source computer also determine the language of the installer on the USB drive, so make sure they're consistent.

Microsoft's Installer

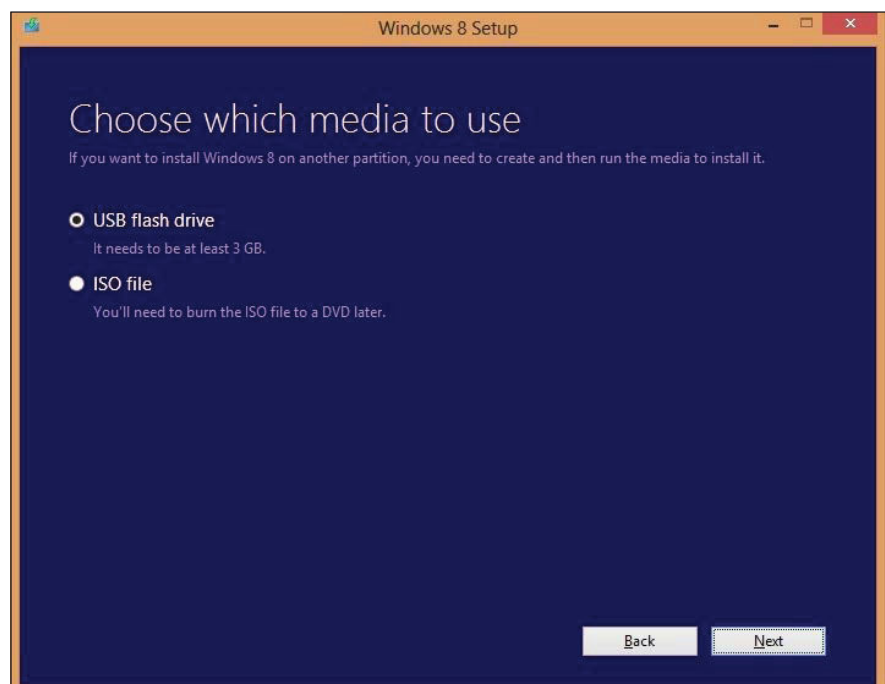
The next step is to download the Windows 8 Installer from tinyurl.com/92rc7xk. Although this Microsoft page warns you that you need to be using the computer you plan to upgrade,

you can ignore that for now because you'll be choosing the Install By Creating Media option. Click the Install Windows 8 button and then

click Save to download the installer executable.

Double-click the downloaded file, named Windows8-Setup.exe, click Yes if you receive a UAC prompt, then input your Windows 8 product key and click Next. After a short wait, you will see a screen that displays the version of Windows you're about to download (as determined by the product key you input). This screen also warns that you should not attempt to download Windows 8 while on a metered plan, as doing so will consume a considerable amount of your allotted bandwidth. The Windows 8 install files will consume approximately 3GB or more of a USB drive when all is said and done. Click Next to continue.

While Windows downloads, you'll be able to keep tabs on the percent completion as well as the estimated time remaining. On our test machine, we can typically achieve a speedtest.net score of 10Mbps or better for downloads, which let us download the Windows 8 install files in approximately 20 minutes. A slower connection will result in a more time-



Choose the USB Flash Drive option when you come to the media selection screen.

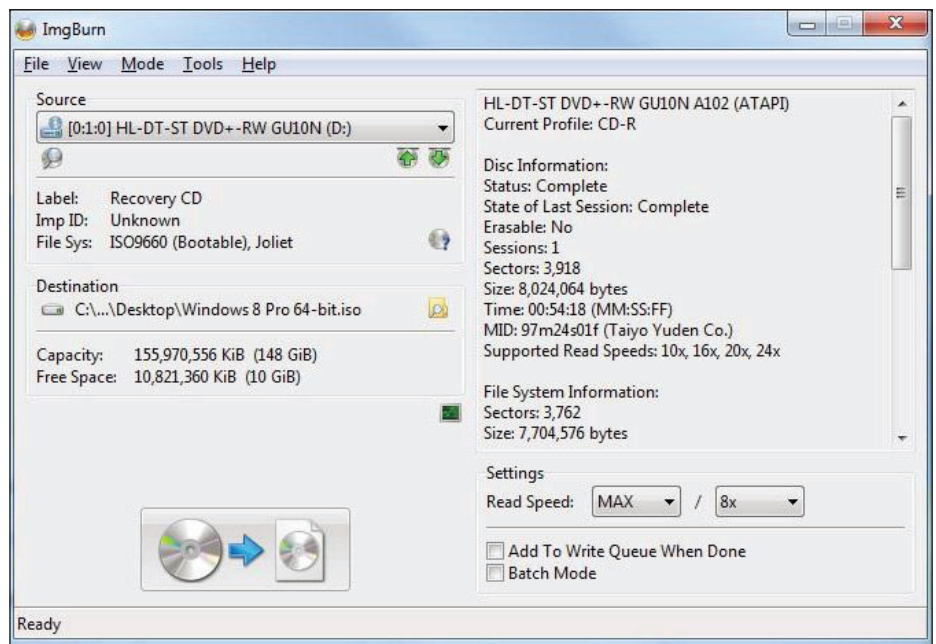
consuming download. When the download is complete, click the Install By Creating Media radio button and then click Next.

If you plan to install Windows on a separate partition on this or another computer, Microsoft's Windows 8 installer recommends you create the new partition now. You can do this using the Disk Management snap-in, accessible by right-clicking Computer (in Desktop mode), clicking Manage, and then clicking Disk Management in the left pane of the Device Manager. Right-click the disk you want to add a partition to, then click Shrink Volume if there's no unformatted space available. When that's done, use the utility to format the unallocated space as a new partition.

Now you need to get your hands on a 4GB or larger USB drive. Your typical 4GB flash drive will format to between 3.6 and 3.8GB, which should be enough room. Back on the Win8 Installer, you can select USB Flash Drive or ISO File; choose the former by clicking the appropriate radio button, and then click Next. The installer utility will search your computer for suitable USB drives and display them on the following page. We recommend disconnecting any unnecessary USB drives to ensure the Win8 install files go to the intended drive. Click the drive you want to use and click Next to continue.

The utility prompts you that it is about to format the USB drive for use as a bootable install drive, so any files on it will be deleted. Click Yes to continue. The utility will then prepare and create the USB flash drive. This operation took about 10 minutes on our test machine. When it completes, the utility will show you the Windows product key one more time: Make sure to write it down and keep it handy. Now you can click the Finish button to close the window.

The next step is to plug the new Win8 install USB drive into the computer you



ImgBurn can make short work of converting the install disc into an ISO image.

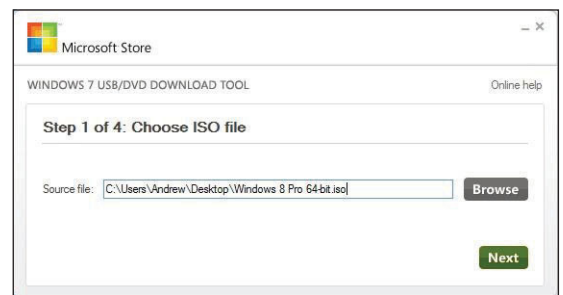
want to install Win8 on and boot from it. To do this, shut the computer down, access the BIOS by pressing the DELETE, F1, F2, ESC, or F12 key, and then change the boot order so that the first device is the USB drive you just created. Save the changes and restart the computer. Then just follow the on-screen prompts to install Windows 8 from your USB drive.

An Alternative For OEM Discs

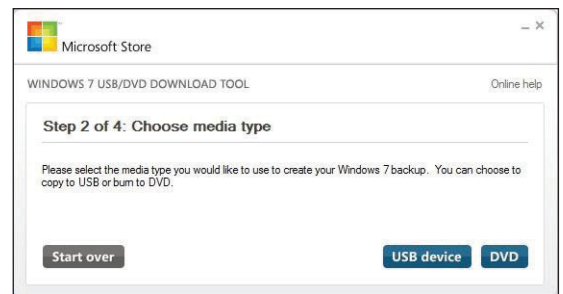
If your copy of Windows 8 happens to be an OEM version—not uncommon for those of us who build our own systems—then the tutorial above won't do much for you. But that doesn't mean you still can't enjoy the benefits of the USB-based install. In this case, however, you'll need the physical Windows 8 installation discs in order to proceed.

The first thing you need to do is to convert the files

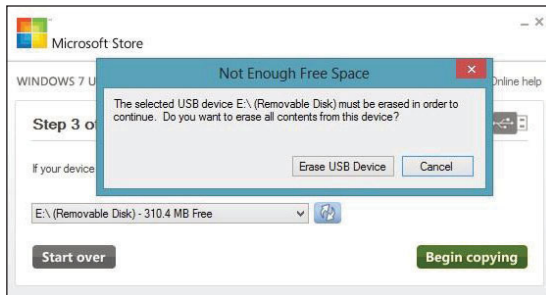
on your Win8 installation disc into an ISO image, which you can then copy to a 4GB or larger USB drive using the Windows 7 USB/DVD Download Tool.



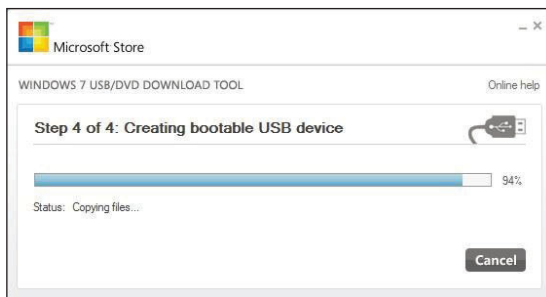
The Windows 7 USB/DVD Download Tool works just fine on Windows 8 ISOs.



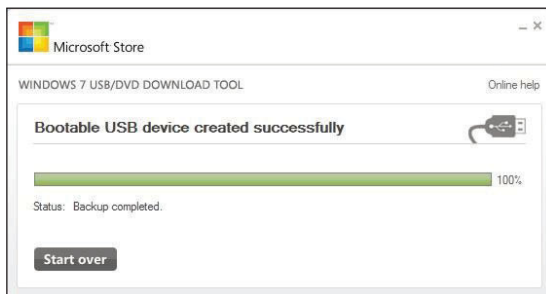
Select USB Device in step two.



Make sure there's nothing important on the USB drive; it'll be formatted before the ISO is written to it.



Copying the files to the USB drive only takes a few minutes.



When you're finished, you can install Windows 8 on a desktop or notebook PC without connecting an optical drive.

Despite the name, this utility will work with Windows 8.

Our ISO-creating utility of choice is ImgBurn (www.imgburn.com). Just visit the website, scroll down to the News section and click the download hyperlink in the latest build post. As we went to press, the latest version available was ImgBurn v2.5.8.0. Choose a mirror from the next page and download the installation file, saving it to your computer. Click Run when the download completes and follow the instruction in the installation wizard to proceed. When you get to the page that lets you choose Express or Custom Installation, you can opt out of installing a few third-party browser add-ons via the latter choice. Keep in mind, ImgBurn is free software, so if you find yourself using it regularly, consider donating to the developer using the PayPal button on the left side of the ImgBurn website.

Once installed, close the installer and launch the utility. Now eject the tray on your optical drive and insert your Windows 8 installation disc and close the tray. If you

want a 64-bit version of the OS on the USB drive, then make sure you use the 64-bit install disc. From ImgBurn's main menu, click the Create Image File From Disc button, then choose the optical drive loaded with the Win8 installation disc for the Source. Make sure to change the destination directory to a known location or note that the default location is the C:\ drive. Click the Read button to begin the ISO-creation process. An audio tone will sound when the process is complete.

You can download the other utility you will need, the Windows 7 USB/DVD Download Tool, from Microsoft's CodePlex open-source hosting site (wudt.codeplex.com). Just click the Download button on the right side of the website, click Run to install the program, and follow the on-screen prompts to complete the operation.

Next, insert a 4GB or larger USB drive in a spare port on your computer and launch the Windows 7 USB/DVD Download Tool. Click the Browse button to locate your Win8 ISO, click Open, then click Next. Click the USB Device button and then click the Begin Copying button on the following screen. You'll get a prompt informing you that the contents of the USB drive will be erased if you proceed; confirm the step and keep going. When the process is complete, the utility will report, "Bootable USB Device Created Successfully."

Now you can treat the USB drive similarly to the Win8 install discs, letting you install the OS without having to resort to plugging in an optical drive. This drive will also let you install using Win8 OEM licenses. Just change the boot order to make the USB drive the first boot device, let the install commence (inputting the Windows product key when necessary), and then change the boot order to make your hard drive or SSD the first boot device the first time the system attempts to restart. ■

Now you can treat the USB drive similarly to the Win8 install discs, letting you install the OS without having to resort to plugging in an optical drive.

Build Your Own BRIX

GIGABYTE's Mini PC Maxes Out On Power

Attractive, tiny computers are nothing new. But as you would expect from a performance vendor like GIGABYTE, its contender in this arena ups the hot rod factor by a significant margin.

BRIX is an ultra compact PC only 1.2 x 4.2 x 4.5 inches (HxWxD) in size. That's smaller in every dimension than a stack of three CD jewel cases, assuming you remember those. It comes as a barebones kit you complete yourself.

BRIX is beautiful enough to display proudly, and many of its users do. At the same time, however, it's discreet enough to mount on the back of a flat-screen TV or monitor. Boasting multi-cored x86/x64 power and integrated graphics, BRIX can even run two displays at the same time.

If you've already started to think of a few uses for a PC like this, you're not alone. Its remarkable characteristics make it a great choice for all sorts of roles.

"BRIX is targeted at not just one audience, but many," says GIGABYTE Channel Marketing Manager Leon Chen. "Since this ultra compact PC is so versatile, it is suitable for consumers as well as business, industrial, or government use."

What You Get

This mini-PC "barebones" kit is surprisingly well-furnished. Under the "stylish glass surface mounted on an anthracite aluminum frame," as GIGABYTE describes it, BRIX packs a 3rd Generation "Ivy Bridge" Intel Core processor with integrated Intel HD 4000 graphics. (See the "GIGABYTE BRIX Specifications" sidebar for more information.)

A motherboard is included with the kit, as is an 802.11b/g/n Wi-Fi module that fits in one of the two mini PCIe



BRIX is pretty enough to show off but small enough to hide.

slots. GIGABYTE packs the necessary AC power adapter along with the BRIX, so you don't have to scour the Internet for one with similar power characteristics and the right connector. Yes, some competitors surprisingly do sell ultra compact PC kits without this critical piece of the puzzle, or at least without the cord designed to attach the AC adapter to the wall outlet.

Finally, there's an important bracket in the box. "The BRIX can be placed on a desk or just any flat surface," Chen says, but "included with the BRIX is also a VESA mount which allows the unit to be mounted on the back of any VESA mount-capable monitor or TV. It allows it to be placed out of sight as well as to give it a more 'together' look and feel of the unit and the display."

This leaves just a few components for your own shopping list, making it simple for you to get your BRIX up and going.

"All users need to buy and install are DDR3 SO-DIMM memory modules and an mSATA SSD for storage," says Chen. "These two components will allow the system to boot, and then users can install their own OS." All other necessary parts are included.

You can currently buy an mSATA SSD in capacities of up to 480GB. Most of the well-known SSD manufacturers sell these typically caseless, card-style drives, but we've also run across entrants from several less familiar vendors. Many mSATA SSDs feature read/write and input/output rates comparable to traditional, 2.5-inch SSDs, so you're not necessarily



With ports for both HDMI and DisplayPort, BRIX can power two TVs or displays simultaneously.

giving up any responsiveness from your system by opting for compactness.

There are less pricey storage options than SSDs, too. The Wi-Fi module included with the BRIX, along with its Gigabit Ethernet port, open up the possibility for network- and cloud-based mass storage solutions. More locally, the unit's USB ports allow connection to external (but potentially compact) hard drives and even BD/DVD drives.

As for RAM, BRIX supports up to 16GB of DDR3-1600/1333 memory in a 2-slot SO-DIMM configuration. That's

more than enough DRAM for all but the most demanding tasks.

Put BRIX To Work

There are shedloads of uses—niche and mainstream—for a system as compact and powerful as BRIX. When a Raspberry Pi just won't cut it, GIGABYTE has your back.

As an HTPC, BRIX leverages the graphics built into the Core processor to render hardware-accelerated HD video with ease. Intel HD graphics may not bring LAN gamers running to the eminently portable PC, but it's certainly

up to the task of HD media playback and streaming.

"BRIX doesn't produce much noise to distract you from what you are watching," Chen says. Also, "it doesn't block the TV or other components (DVD players, PS3s, Xbox, or audio equipment)." Chen further points out that BRIX's HDMI connection reduces cable clutter by carrying both audio and video through a single cable.

For digital signage, Chen says, "BRIX takes small to a whole other level. Because you can place more than 64GB of storage onboard (not including USB connections), BRIX can store enough graphics or videos for digital signage. Also, the system produces very little heat and can be mounted and hidden easily out of sight," such as in a kiosk.

Closer to the mainstream, BRIX also makes a great, general purpose home/office PC.

"Although the BRIX seems perfect for these non-demanding functions, it still performs exceptionally well in the home/office environment," Chen says. "With an optional Core i5 or i7 CPU, the BRIX can handle functions that most desktop PCs can from the



Add your own notebook-style DDR3 and an mSATA SSD, and you're ready to install your choice of OS.

Microsoft Office suite, web browsing and surfing, and video streaming. It can do all these functions and more.”

BRIX is a perfect fit in places where there’s little room (or desire) for a tower case, such as a cluttered desk, a dorm room, and so on. Hang it out of sight on the back of a display, add a link to a mass storage unit or service, and you’ve just turned your monitor into a stylish AIO (all-in-one) PC.

“With its small footprint, there are many applicable areas where the BRIX may come into play,” Chen says. “POS (point-of-sale), in-car computer (carputer), meeting room or presentation room systems, or help desk computer . . . BRIX is suitable for all of these applications in the sense that it is small, compact, and space-saving.”

Not Just A NUC

Sharp-eyed CPU readers no doubt see the origins of BRIX in the NUC (Next Unit of Computing) ultra compact PC platform from Intel. The chipmaking giant pioneered the new form factor, which supports 4 x 4-inch (100 x 105mm and 101.6 x 101.6mm) motherboards.

Of course, GIGABYTE has put its own spin on the platform. Most obviously, BRIX comes in a Core i7 edition, whereas Intel’s NUC currently tops out with a Core i5-3427U. The more powerful chip brings up to

3.1GHz of dual-core, Hyper-Threaded fury to bear on your workload.

At the same time, GIGABYTE shrank the dimensions of the platform a bit. BRIX is 0.35 inch shorter than NUC, which stands at 1.55 inches in height. Despite the smaller case, and the beefier processor, BRIX nevertheless maintains a low noise profile for quiet operation.

“BRIX is currently in its own class,” Chen asserts. “Aside from being somewhat comparable to the Intel NUC, there aren’t many other ultra compact systems that can outmatch the

performance and size of GIGABYTE’s BRIX system.”

In addition, Intel doesn’t bundle a power cable with the NUC, although it does provide a suitable AC adapter. Nor does the company offer a NUC with a Wi-Fi adapter at press time. Granted, you’ll pay a bit more for the GIGABYTE BRIX system, but there’s a lot to be said for a kit that’s more complete.

All in all, we’re impressed with BRIX, and can’t wait to see what GIGABYTE will build with it next. ■

GIGABYTE BRIX SPECIFICATIONS

Model	GB-XM1-3537	GB-XM11-3337	GB-XM12-3227
Dimensions (HxWxD)	1.2 x 4.2 x 4.5 inches	1.2 x 4.2 x 4.5 inches	1.2 x 4.2 x 4.5 inches
CPU	Intel Core i7-3537U 2GHz/3.1GHz (Turbo Boost); dual-core; HyperThreading; 4MB Smart Cache	Intel Core i5-3337U 1.8GHz/2.7GHz (Turbo Boost); dual-core; HyperThreading; 3MB Smart Cache	Intel Core i3-3227U 1.9GHz; dual-core; HyperThreading; 3MB Smart Cache
Chipset	Intel HM77	Intel HM77	Intel HM77
Memory support	2 x SO-DIMM DDR3 slots; 1333/1600MHz; max. 16GB (8GB x 2)	2 x SO-DIMM DDR3 slots; 1333/1600MHz; max. 16GB (8GB x 2)	2 x SO-DIMM DDR3 slots; 1333/1600MHz; max. 16GB (8GB x 2)
LAN	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n
Graphics	Intel HD 4000 graphics	Intel HD 4000 graphics	Intel HD 4000 graphics
Expansion Slots	1 x mSATA slot; 1 x half-size mini-PCIe slot (occupied by the Wi-Fi card)	1 x mSATA slot; 1 x half-size mini-PCIe slot (occupied by the Wi-Fi card)	1 x mSATA slot; 1 x half-size mini-PCIe slot (occupied by the Wi-Fi card)
Front I/O	1 x USB 3.0	1 x USB 3.0	1 x USB 3.0
Rear I/O	1 x HDMI; 1 x mini DisplayPort; 1 x USB 3.0; 1 x RJ45; 1 x DC-19V; 1 x Kensington lock slot	1 x HDMI; 1 x mini DisplayPort; 1 x USB 3.0; 1 x RJ45; 1 x DC-19V; 1 x Kensington lock slot	1 x HDMI; 1 x mini DisplayPort; 1 x USB 3.0; 1 x RJ45; 1 x DC-19V; 1 x Kensington lock slot
Power Supply	Input: AC 100-240V; Output: DC 19V; 3.42A	Input: AC 100-240V; Output: DC 19V; 3.42A	Input: AC 100-240V; Output: DC 19V; 3.42A
Mount support	VESA 75 x 75mm and 100 x 100mm (bracket included)	VESA 75 x 75mm and 100 x 100mm (bracket included)	VESA 75 x 75mm and 100 x 100mm (bracket included)
Price	\$489.99	\$379.99	\$299.99

SUPERMICR[®]

Hyper-Speed Gaming System

Extreme Performance with Hardware Acceleration



Rear View

SYS-5038AD-T

C7Z87-OCE + CSE-732G-903B

Gaming System - Normal Operation Mode (Blue Color)

- Colored LEDs indicate mode of Operation ● ● ●
- Single Socket H3 (LGA 1150) Supports for Intel® Xeon® Processor E3-1200 v3 product family, Intel® 4th Gen. Core i3/i5/i7 Processors
- Up to 32GB DDR3 non-ECC 1600MHz UDIMM in 4 Sockets; Over-clocking Support up to 3000MHz
- Internal 3x Hot-swap 3.5" HDD Bays, Front 2x Hot-swap 3.5" HDD Bays
- Optional Front 4x Hot-swap 2.5" HDD Cage Available
- Triple Display Capable (DVI, VGA, HDMI, DP: Thunderbolt Port)
- 3 PCI-E 3.0 x16 slots
- Front 2 USB 3.0, 2 USB 2.0, 1 eSATA and audio ports
- OCE Capable



Hardware Acceleration Mode
(Orange Color)



Hardware Acceleration Mode
(Purple Color)



C7Z87



C7Z87-OCE



www.supermicro.com/SuperWorkstation

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LEPA MaxBron Power Supplies

80 PLUS Bronze Efficiency On A Budget

You may know enough about power supplies to want more than just a particular number of watts at a good price. For instance, you might be aware that your new PSU needs to support Intel 4th Generation “Haswell” Core processors, and you might want it to meet a certain level of power efficiency at the same time.

If you’re this type of user, give some consideration to LEPA’s new MaxBron line of PSUs (\$69.99 to \$139.99,

www.lepausa.com). MaxBron is a semi-modular design that comes with the types of cables your modern PC needs. It’s 80 PLUS Bronze efficient and won’t zap you with sticker shock.

“MaxBron is a perfect choice for . . . home system users, office PC users, and even heavy-duty gamers,” says Alice Tseng, product manager for LEPA. “MaxBron products provide six different outputs from mid to high wattages.

Currently available on the U.S. market, however, are four of the MaxBron models: 450W, 700W, 800W, and 1000W.

“For those who demand stable, silent, and efficient power solutions, MaxBron will definitely be a great choice.”

Tech & Efficiency

From the outset, LEPA designed the MaxBron family to meet certain energy requirements without costing a great deal.



LEPA crafted the MaxBron line with a semi-modular design. Cables such as the 20+4-pin main power line, which every compatible motherboard needs to use, are hardwired to avoid possible power loss.

“To meet the latest Energy Star 6.0 energy-saving standard, a system has to be equipped with at least an 80 PLUS Bronze product, which requires efficiency to meet 82%/85%/82% levels under 20%/50%/100% loading, respectively,” says Tseng.

These energy goals behooved LEPA to consider using different circuit designs in the development of the new power supply line.

“There are many topologies for making a power supply, such as half bridge, full bridge, double forward, resonant, fly-back, active clamp and so on,” says Tseng. “Our R&D team chose the double forward topology as the most appropriate and stable design to make MaxBron.”

There are more exotic topologies that can yield greater efficiency in high-wattage PSUs, such as the FMQ (Full-Zone Magnetic Quadrant) design used in parent company ENERMAX's Platimax 1200W and 1350W power supplies. On the other hand, such advanced technology also increases the final cost of the PSU. LEPA chose to keep its new product line in a more affordable price bracket to appeal to a far broader base of users.

“The MaxBron series includes many up-to-date designs with reasonable prices,” Tseng says. A case in point is the MaxBron top model, the B1000-MB, which supplies 1,000W of continuous power for a mere \$139.99.

Despite its modest cost, both upfront and over time, MaxBron also incorporates a high-efficiency +5Vsb circuit that enables it to sip less than 1W of power when in standby mode. This helps the PSU line to meet the EU's ErP Lot 6 energy standard.



The Anti3s Q-Brick is a silicon bumper for the MaxBrons' edges and corners. Not only does it reduce the risks of physical and electrostatic shock, it also helps to keep the PSU from slipping out of position in transit.

Speaking of low power consumption, MaxBron is built to support the unique, low-amperage needs of Intel Haswell chips.

“The new C6/C7 states of Intel's Haswell processors enable CPU power consumption to be reduced to just 0.05A,” says Tseng.

“Some designs of outdated power supplies cannot provide stable voltage under such low loads, which may cause the system to shut down or bring it to a halt,” Tseng adds. “MaxBron is equipped with a load stabilizer circuit to ensure stable voltage at ultra-low load and support Intel Haswell perfectly.”

LEPA's MaxBron shares some characteristics with enthusiast-level power

supplies, such as a single 12V rail for high-wattage graphics cards. It also includes active PFC (power factor correction) technology to prevent the PSU from contaminating local AC circuits with “dirty” power.

Anti3s Q-Brick

An eye-catching part of the MaxBron's looks is its Anti3s Q-Brick skin, which covers the edges and corners of the PSU like the chinstrap on a wrestler.

“The special Anti3s Q-Brick is a brand-new design for decorating the PSU,” Tseng says. “However, we came up with this idea of creating something not only for

“We came up with this idea of creating something not only for beauty but something that also provides functionality to make a PSU more fun.” -Alice Tseng, LEPA



The 450-watt MaxBron unit doesn't have the same thermal output as its big brothers, so this smaller 120mm fan is the perfect size.



An 800-watt edition helps you choose the right LEPA MaxBron for your budget and performance needs.

beauty but something that also provides functionality to make a PSU more fun.”

LEPA says that the “3s” part of the Anti3s Q-Brick’s name stands for anti-shock, anti-static electricity, and anti-slip. The silicon jelly skin case is designed to minimize static electricity, shock during transportation, and slips during installation.

“Furthermore, we offer different options of replacing the red Anti3s Q-Brick with an included black one, or even removing it from the power supply,” Tseng says. The extra Anti3s Q-Brick can also be repurposed to another PSU of similar size or simply kept in the package box as a spare until needed.

“It is a beautiful jacket that allows for your power supply to stand out,” Tseng says. “We hope to bring users different experiences that create a more appealing and interesting PSU.”

Silent Strength

Part of the deal for any power supply that a *CPU* reader would buy has to be quiet, effective cooling. LEPA chose to outfit its MaxBron PSUs with a hydraulic bearing fan for silence and durability.

“Basically, the hydraulic bearing fan is an advanced design which stores more lubricant than a conventional bearing,” Tseng says. “This design ensures that the fan shaft is fully covered by a special lubricant to eliminate friction. In short, noise can be reduced and the fan’s life span can be extended.”

LEPA places a 135mm fan in the bottoms of the three higher-wattage MaxBron models. The 450W edition doesn’t need as much airflow to stay cool, so it can cruise along happily with a 120mm blower.

“Furthermore, MaxBron has a bigger heatsink to enhance the thermal dissipation,” says Tseng. “By doing so, the fan can run at a lower speed, creating a more silent operation.”

As you would expect, LEPA designed MaxBron to have overpower, overvoltage, and short circuit protection. These are standard safety measures that you should nevertheless remember to check for before you buy a PSU.

Oh, and no worries about MaxBron’s compatibility with CrossFireX and SLI multi-GPU setups. The PSU family’s

moderate pricing belies the level of power it can provide.

“The MaxBron PSU is designed with a powerful single +12V rail, which can provide maximum power and compatibility to support heavy users’ demand of multiple or high-end graphic cards,” Tseng assures us. “Moreover, MaxBron’s +12V output capability is more than 97% of total output. It is definitely the perfect choice for SLI or CrossFireX.”

Cables & Connections

Because your PC undoubtedly requires the use of a 20- or 24-pin main power harness, there’s no reason to manufacture this important connection with a detachable cable. Therefore, LEPA makes the MaxBron family semi-modular, so that the main power harness can’t be removed. This design eliminates a potential source of power loss across an unnecessary connector.

That said, every MaxBron PSU comes with a full array of optional power cables appropriate to its wattage level. For example, the 450W version includes two 6+2-pin PCI-E cables, which can light up two entry-level or one midrange video card. Step up to the 1,000W MaxBron, and you’ll have a commendable six PCI-E connectors (6+2-pin) at your disposal for some serious graphical horsepower.

LEPA also realizes that some PC applications require additional cable length.

“The MaxBron series fits all ATX cases, or even bigger cases,” Tseng says. “It features a semi-modular cable design to give users more flexibility to select cables they need and help air dissipation inside the case.”

“All the cables are sleeved and long enough for users to route on the back side of the motherboard tray to maintain better cable management, especially with an extended CPU connector cable of around 23.6 inches,” Tseng continues. “No more cable clutter inside the chassis. MaxBron is perfect for small to large cases.”

LEPA MAXBRON SPECIFICATIONS

Model	B1000-MB	B800-MB	B700-MB	B450-MB
Rated continuous (W)	1000	800	700	450
12V rails	1	1	1	1
+12V max (A)	83	65	58	37.5
+5V max (A)	24	24	24	15
+3.3V max (A)	24	24	24	21
SLI/CrossFire-ready	Yes	Yes	Yes	Yes
Max wattage (advertised)	1050	850	750	500
Power factor (advertised)	Up to 0.99	Up to 0.99	Up to 0.99	Up to 0.99
Efficiency rating (advertised)	80 PLUS Bronze	80 PLUS Bronze	80 PLUS Bronze	80 PLUS Bronze
Fan	135mm	135mm	135mm	120mm
PCI-E	6 (6+2-pin)	4 (6+2-pin)	4 (6+2-pin)	2 (6+2-pin)
Main 12V	20+4-pin	20+4-pin	20+4-pin	20+4-pin
8-pin EPS12V	2 (1 4+4-pin, 1 8-pin)	2 (1 4+4-pin, 1 8-pin)	1 4+4-pin	1 4+4-pin
SATA	12	12	9	5
4-pin Molex	6	4	4	4
Floppy	1	1	1	1
Length, inches (not including cable bend)	6.5	6.5	6.5	6.3
Warranty	2 years	2 years	2 years	2 years
Price	\$139.99	\$109.99	\$99.99	\$69.99

LEPA Of Faith

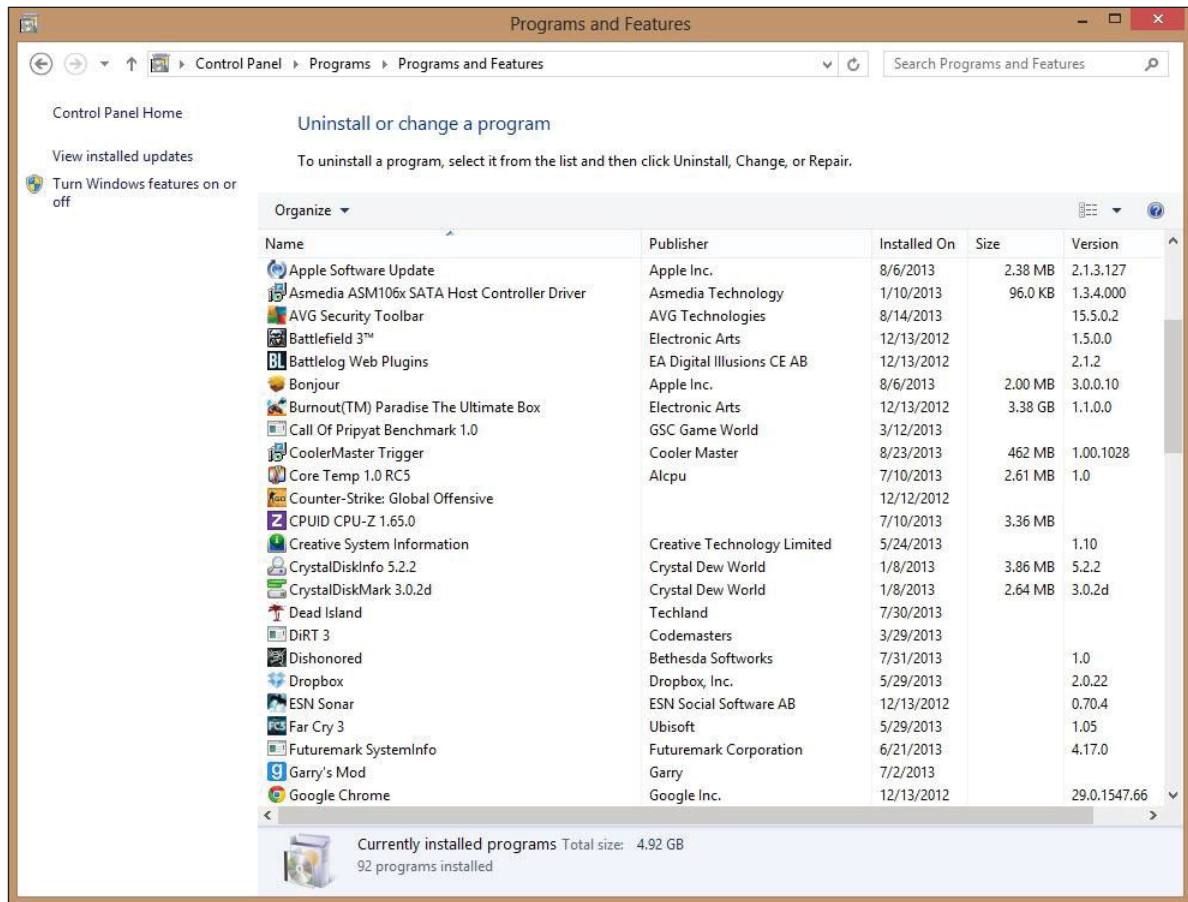
Like ENERMAX, LEPA is an after-market PC products vendor distributed in the United States by ECOMASTER.

“LEPA is a relatively new company. We are very energetic and full of originality, with a focus on designing and making eco-friendly products,” Tseng says.

“Moreover, as LEPA always does, the MaxBron series provides great performance for a relatively small price.”

For a modest build or a moderately heavyweight game station, there’s a MaxBron model to fit your needs . . . and your budget. ■

Prep For Launch: Laying The Groundwork For Win8.1



Using the Uninstall A Program utility should be your first stop anytime you want to free up space.

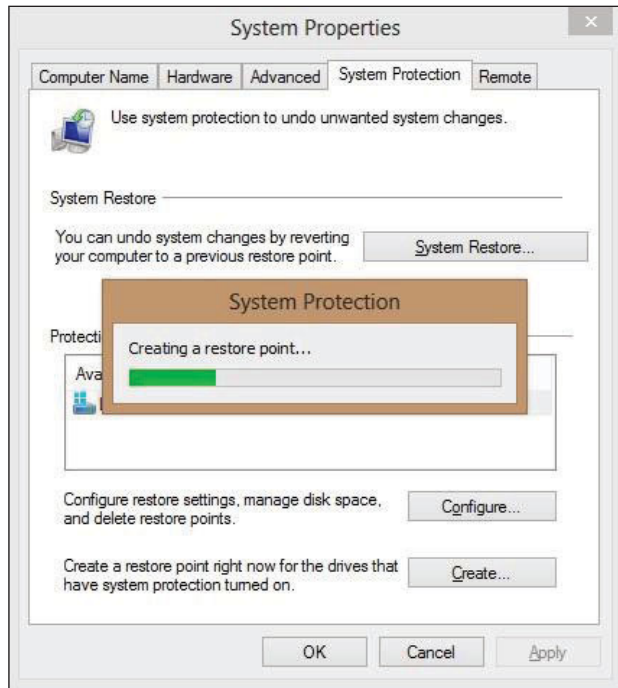
As we went to press, we were still about a month away from Microsoft's first big service pack/overhaul, Windows 8.1. In preparation, we're going to show you how to clean up your OS drive to free up space, improve performance, and basically lay the foundation for the upcoming update.

Before we start deleting caches of files, it's a good idea to create a restore point. To access this feature in Windows 8, you can type **create a**

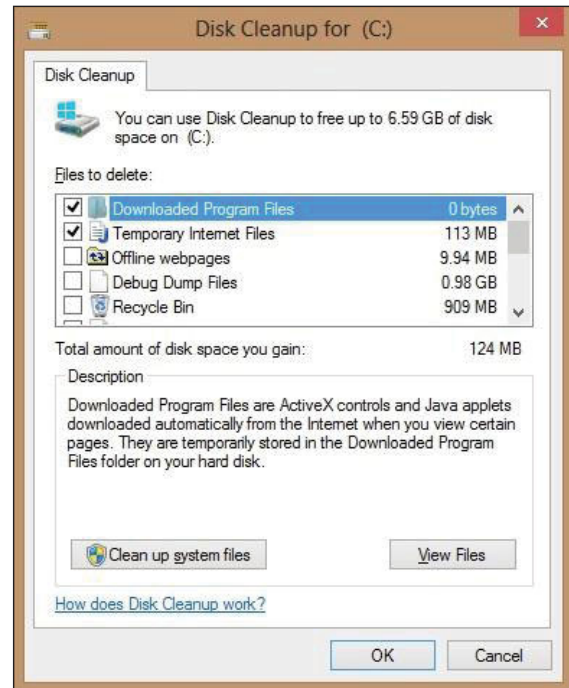
restore point on the Start screen. In Desktop mode, open the Charms bar, click Settings, Control Panel, System And Security, and System, and then click the System Protection hyperlink on the left side of the screen. Click the Create icon at the bottom of the System Properties window, then name the restore point and click Create to continue. You can close the program after dismissing the Restore Point Was Created Successfully message.

The Manual Scrub

The first thing you should do if you haven't in a while is open the Uninstall Or Change A Program utility and remove any applications you don't use. In Desktop mode, swipe to the right side of the screen to expose the Charms bar, click Settings, Control Panel, and then click the Uninstall A Program hyperlink from the Programs category. Make note of the applications you uninstall; you may need to go



Make sure to create a restore point before running the Disk Cleanup utility.



Although it's handy and safe, Disk Cleanup's default scouring isn't very effective.

back later and cleanup bits and pieces that the uninstaller left behind.

Windows 8 Disk Cleanup

The next step is to launch Windows 8's integrated drive cleaning utility. To access Disk Cleanup in Windows 8 from Desktop mode, swipe the cursor up from the lower-right corner of the screen to expose the Charms bar, then click Settings, Control Panel, System And Security, and the Free Up Disk Space hyperlink in the Administrative Tools category. You can more quickly access this utility by pressing WINDOWS-X, clicking Run, typing **cleanmgr.exe** into the text box, and then clicking OK.

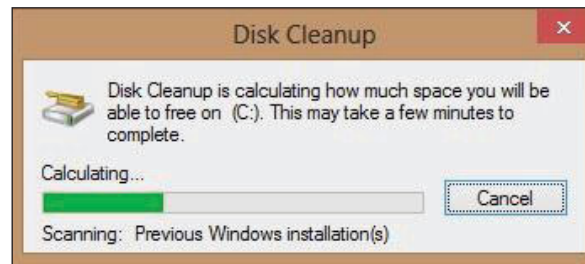
Disk Cleanup scans your C: drive (or whichever drive your OS is installed on) to find downloaded program files, temporary Internet files, offline webpages, debug dump files, files awaiting deletion in the Recycle Bin, setup log files, system error memory dump files, temporary

files, thumbnails, archived system and user error reports, temporary converted files, and more.

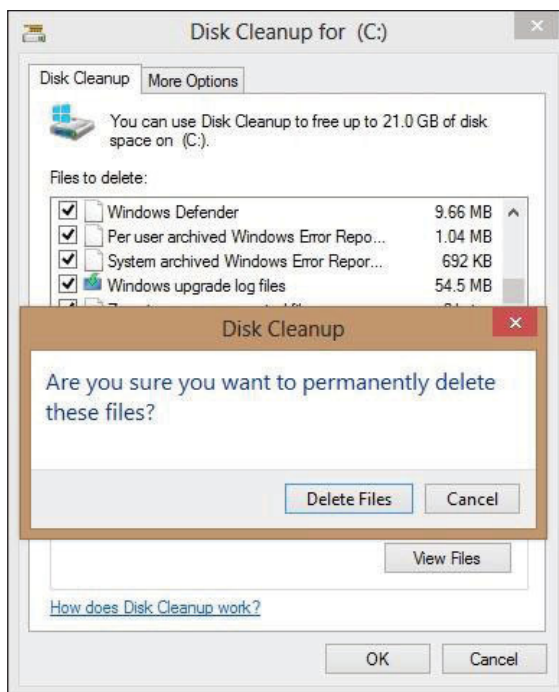
By default, the utility only tags the most benign files for purging,

including downloaded program files, temporary Internet files, and thumbnails. On our bloated test system, this would only have reclaimed 124MB. There's a lot more here we

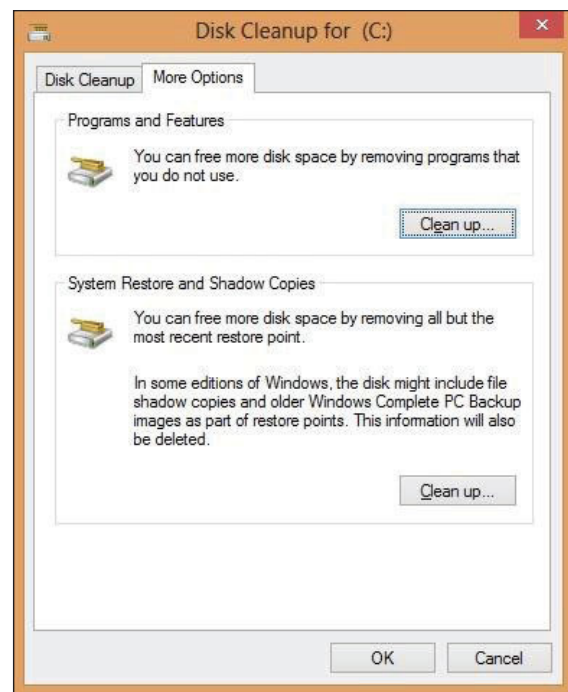
Although it's tempting to select all the checkboxes and click the OK button, take a couple minutes to look over each item in the list to determine if it's something you really want to permanently get rid of.



After clicking Clean Up System Files, the utility will rescan your system for even more data to dispose of.



Click Delete Files to proceed.



The More Options tab lets you purge excess restore points and shadow copies.

need to toss if we're going to make a difference. Helpfully, you can see the amount of space you can reclaim to the right of each item listed in the Disk Cleanup dialog box. Clicking any of the items also displays an informative description to help you determine whether the item is safe to delete.

On our test system, we were able to reclaim about 10MB by removing offline webpages, 1GB from debug dump files, 4.5GB from the Recycle Bin, almost 1GB from system error memory dump files, 3.6GB from temporary files, and a handful of megabytes from other locations.

The 10GB or so we're getting back by nuking it all can really make a difference, but don't purge it just yet. There's a lot more you can add to the list by clicking the Clean Up System Files button at the bottom of the dialog box. After a quick rescan, the utility found another 10GB worth of files it could dispatch, including previous Windows installations, temporary Windows installation files, Windows Update Cleanup files, Windows Defender files, and Windows upgrade log files.

Although it's tempting to select all the checkboxes and click the

OK button, take a couple minutes to look over each item in the list to determine if it's something you really want to permanently get rid of. If you recently installed any updates and have not determined if your system is stable following the changes, or if your computer is experiencing problems of any kind, refrain from nuking log files, error reports, and Windows installation and update files as appropriate. As long as it has been several weeks since your last major update, your computer is running without problems, and you've snagged anything from your old Windows

installations that you might need, you can proceed. One trick you can perform is to disconnect your PC from the Internet (unplug the Ethernet cable) and then restart. Following the restart, there should be no pending updates awaiting installation, so check the boxes and click OK to free up all that space. A pop-up dialog will appear asking if you're sure you want to delete these files; just click Delete Files to proceed. It took our test system less than five minutes to reclaim about 20GB of space on our C: drive.

Back on the Disk Cleanup utility, click the More Options tab to view a couple other ways to slim down your C: drive. Note that the More Options tab may not appear until after you click the Clean Up System Files button. Click the Cleanup button in the Programs And Features area on this tab to simply launch the Uninstall A Program utility. We already covered this, so let's jump to the System Restore And Shadow Copies section of the dialog box. If you click the Clean Up button here, you'll automatically wipe all restore points except the most recent one. The dialog also warns that Windows backup images may also get deleted if you click this button, depending on the version of Windows you're running. Again, as long as your computer has been operating without errors following any recent updates, you should be safe with just the restore point we created at the outset, so click Clean Up, then click Delete when the Are You Sure dialog box pops up.

A Third-Party Sweeper

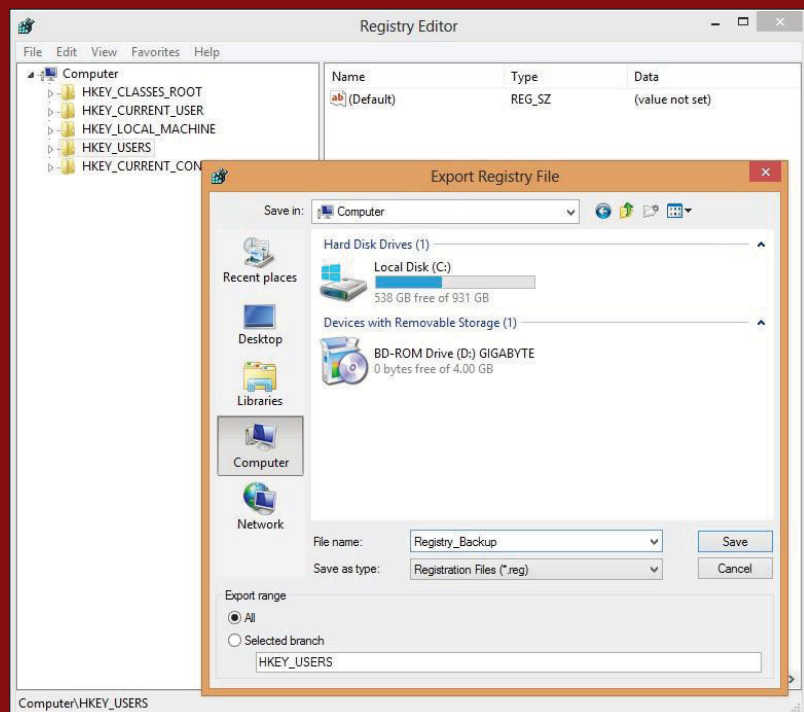
It's true, you can free up a lot of space using the built-in Disk Cleanup utility in Windows, but there are more comprehensive options available, as well. CCleaner (www.piriform.com/ccleaner) is one such program that we've been relying on for years to help up keep our C: drive clean and lean. We like CCleaner because it scans for many unnecessary items that the Windows utility ignores, such as those associated

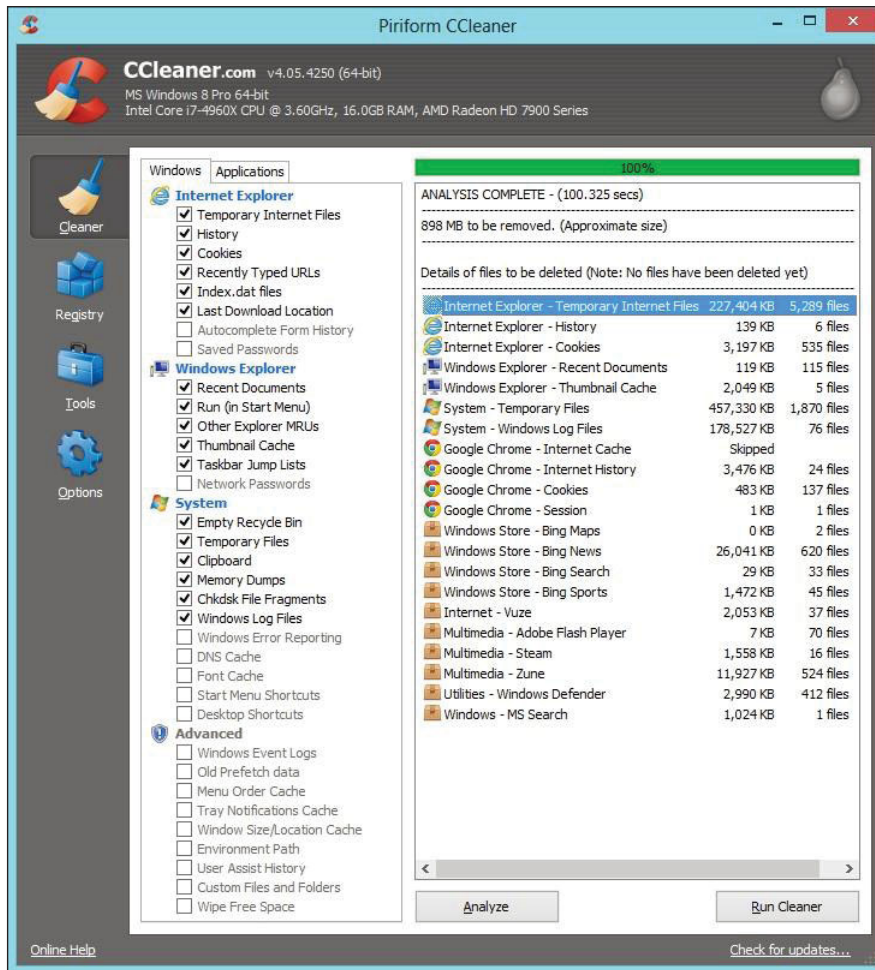
We like CCleaner
because it scans for many
unnecessary items that the
Windows utility ignores.

REGISTRY TIP OF THE MONTH:

Cleanup In Aisle R

We've all encountered one or more applications that fail to fully uninstall. At best these fragments amount to a handful of empty folders scattered throughout your system. But at worst, they can slow your startup and shutdown processes and make your system vulnerable to malware and cybercriminal attacks. To nuke these leftovers, press WINDOWS-X and then click Run. Type regedit and click OK to launch the Registry Editor. To be safe, back up the Registry using the File, Export command. Next, click Computer, Edit, and Find, and make sure the checkboxes in front of Keys, Values, and Data are checked. Next, type the name of the pesky program in the text box and click Find Next to locate fragments; right-click and click Delete on each key you're certain is associated with the offending program. Repeat until you've scoured it from your system.





CCleaner is a third-party utility that complements Windows' built-in utility.

with third-party utilities including Adobe Flash Player, Steam, WinRAR, 7-Zip, and even a handful of items that clearly fall under Windows' domain,

Once installed and launched, CCleaner will offer to keep the handful of browser cookies that let you retain your persistent logins for various sites,

such as Windows Defender, Windows Media Player, and others.

Just visit the website, click the download button, and then either choose a download mirror under the CCleaner Free column or click the Download button under CCleaner Professional to get the paid application that adds automatic updates, system monitoring, the ability to clean multiple profiles, and more. Once the file is downloaded, click Run to install it on your system. The latest version available as we went to press was CCleaner 4.06.4324 and it was 4.17MB in size. If you leave the default options in place, CCleaner will add Run and Open commands to the Recycle Bin context menu. Clicking the Advanced button prior to installation lets you just install the utility for the current user. The installer may also attempt to install a browser add-on, so proceed carefully, unchecking the box where necessary if you'd like to avoid installing it.

Once installed and launched, CCleaner will offer to keep the handful of browser cookies that let you retain your persistent logins for various sites, such as webmail and social networking sites. Click Yes to scan with this filter or No to group these cookies with all others earmarked for deletion.

On the CCleaner interface, click Analyze to scan the default locations for unnecessary files that can give your system some extra breathing room. Even after lopping off 20GB using Window's Disk Cleanup utility, CCleaner found an additional 1.5GB worth of junk scattered throughout Internet Explorer, Windows Explorer, and the System repositories. You can uncheck any of the scanned locations to omit the found files from the cleaning operation. You can also right-click any of the locations to access Check All, Uncheck All, or Restore Default State. When you're ready, click Run Cleaner to purge the selected files. ■

GT-S

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OfficeMax

amazon.com

NCIX

BREED

performance-pcs.com

DIRECTRON.COM

www.aerocool.us

Upgrades That'll Keep You Humming Along

This month's list of software updates is an exciting mix. There's love for mobile device syncing, your privacy concerns, and system protection/migration in light of today's technology.

SOFTWARE UPDATES

Future Systems Solutions Casper 8.0

This user-friendly disk-imaging utility helps you back up your system with either an instantly bootable backup or a restore-point regime. New features include one-step restore, easy resume when a backup is interrupted, script and automation support, and more. Casper 8.0 works with Windows 8/7/Vista/XP 2000 Pro, and can store disk images anywhere, including network locations.

www.fssdev.com

Hidden Reflex Epic Privacy Browser

This new incarnation of the Epic Browser, formerly built on Firefox, is now based on the open-source Chromium platform related to Google's Chrome browser. As its name implies, the new Epic Privacy Browser strives to keep your web use private. It blocks third-party tracking scripts, prefers encrypted communication by default, offers a 1-click proxy, keeps sites from storing your searches, and much more. Hidden Reflex describes itself as a Bangalore- and US-based, privately funded startup.

epicbrowser.com

Laplink Sync

Using a Bluetooth, wireless, or wired connection, Laplink Sync can keep your Windows and Android smartphones, tablets, and PCs up-to-date with the

latest versions of your designated files or folders. (Laplink says that support for Apple devices is coming soon.) The software uses peer-to-peer connectivity to affect the sync, so you don't have to have an Internet connection to use it as you would with a cloud-based utility. Laplink's UltraSync technology keeps track of deleted, added, and modified files to speed things along.

www.laplink.com

Paragon Migrate OS to SSD 3.0

Upgrading a computer's boot drive to a fast, new SSD is cause for celebration. Potentially dampening the festivities is the fact that moving an installed OS to an often smaller drive can be tricky even for power users. This paragon utility makes the job easy. It will automatically align your partitions for proper I/O performance, and version 3.0 lets you migrate Windows (XP or newer) to a GPT/UEFI configuration from within the OS while you continue to multitask. Paragon Migrate OS to SSD 3.0 supports Windows 8 and Server 2012, too.

www.paragon-software.com

SecureMac PrivacyScan v1.3

This security app for Mac computers identifies threats to your privacy—such as your browsing history, files with sensitive data, and tracking cookies—and lets you decide whether to securely delete them. New in version v1.3 is support for Opera 15 and Chromium. As for Chrome, PrivacyScan gets a Download History

bug fix plus the ability to clean out the browser's Archived Browsing History. PrivacyScan is also available through the Mac App Store.

privacyscan.securemac.com

DRIVER BAY

NVIDIA GeForce Graphics Driver 320.49

The GeForce R320 Game Ready driver supports the recent GeForce GTX 760 GPU, and fixes a passel of problems in driver version 320.18. Performance also gets a boost for a range of older cards (GeForce 400/500/600 series) in games such as Dirt: Showdown, Tomb Raider, Metro: Last Light, Sleeping Dogs, and Assassin's Creed III. Also new are SLI profiles for games such as Call of Juarez: Gunslinger, Dead Island: Riptide, The Walking Dead: Survival Instinct, and Remember Me.

www.nvidia.com/Download/index.aspx

Treexy Driver Fusion 1.7.0

This Steam Greenlight utility, voted in by the online game store's community of users, keeps your PC's drivers and devices running smoothly. New in this release are revamped views and notifications to help you find what you're looking for more quickly. There are some bug fixes, too, plus a new ability to run Driver Fusion without Steam. A free demo of this for-pay utility is available for download.

store.steampowered.com/app/234820

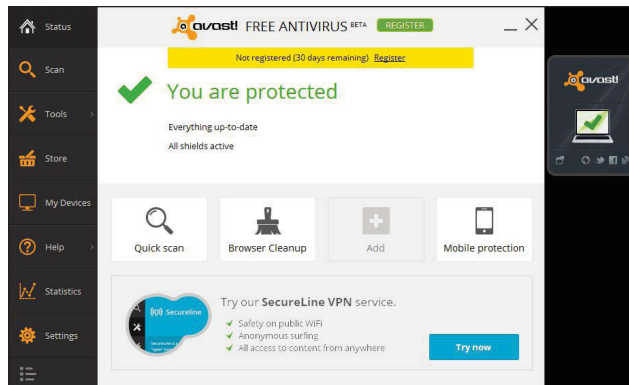
Inside The World Of Betas

AVAST! FREE ANTIVIRUS 2014 BETA 3

Free antivirus has had a colorful history over the past decade. Once few in number, and occasionally missing critical functionality such as automatic virus database updating, no-cost AV utilities now come in a range of fairly solid security options.

This latest beta of one of the bigger names in free AV includes a link to gratis Android device protection. It also scans for rootkits at system bootup, and has a Software Updater function to check for new versions of oft-patched applications on your PC, such as Flash components, browsers, and PDF readers.

Avast enters a silent mode when it detects that you're running a full-screen application, such as a game. You can register, activate, or pay to upgrade to access additional functions such as a firewall, a VPN, hardware virtualization



avast! Free Antivirus 2014 Beta 3

Publisher and URL: AVAST Software, www.avast.com

ETA: 2013

Why You Should Care: You'll get effective, basic security at the best price of all.

support, and a full-control remote access feature.

New in this beta are Windows 8.1 support, WebShield IPv6 compatibility, and some bugfixes and UI tweaks.

Besides the exhortations to register an account and upgrade to a for-pay product, there's little to dislike in this beta. From avast's main menu, you have to click

the Settings tab before you can find the Update button. However, the gadget that avast installs on your Desktop includes one-click Update access, and of course the free software performs virus signature updates (but not version updates) on its own from time to time.

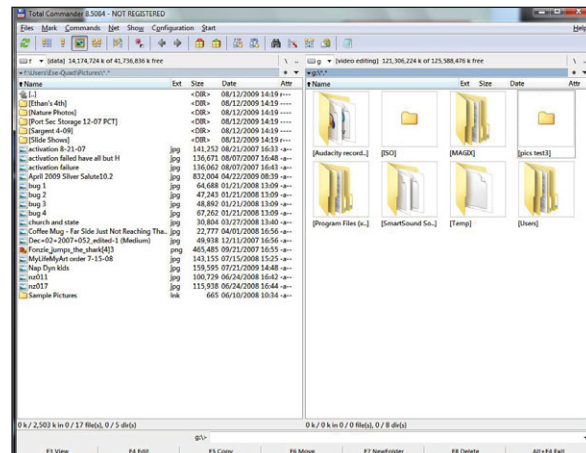
Avast supports 64- and 32-bit editions of Windows 8.x/7 SP1/Vista SP2/XP SP3. ■

TOTAL COMMANDER 8.50 BETA 4

File management in Windows Explorer requires a lot of little tricks—combo keystrokes here, right-clicks there. In fact, you probably use them all the time without giving any thought to the learning curve you once had to climb.

Total Commander is a Windows Explorer replacement. It gives you direct access to many common operations that really shouldn't require finger gymnastics. And it lets you configure its views in the ways you prefer, not just the ways Windows lets you.

Besides utilities such as FTP and de/compression, Total Commander gives you the power to quickly sync directories, compare files, and preview images. Toolbar buttons such as Copy Names With Full Path and Rename Multiple Files should give you a pretty



Total Commander 8.50 Beta 4

Publisher and URL: Christian Ghisler, www.ghisler.com

ETA: 2013

Why You Should Care: Routine and advanced file management chores become so much easier with this replacement for Windows Explorer.

good idea of the amount of time you can save with this software.

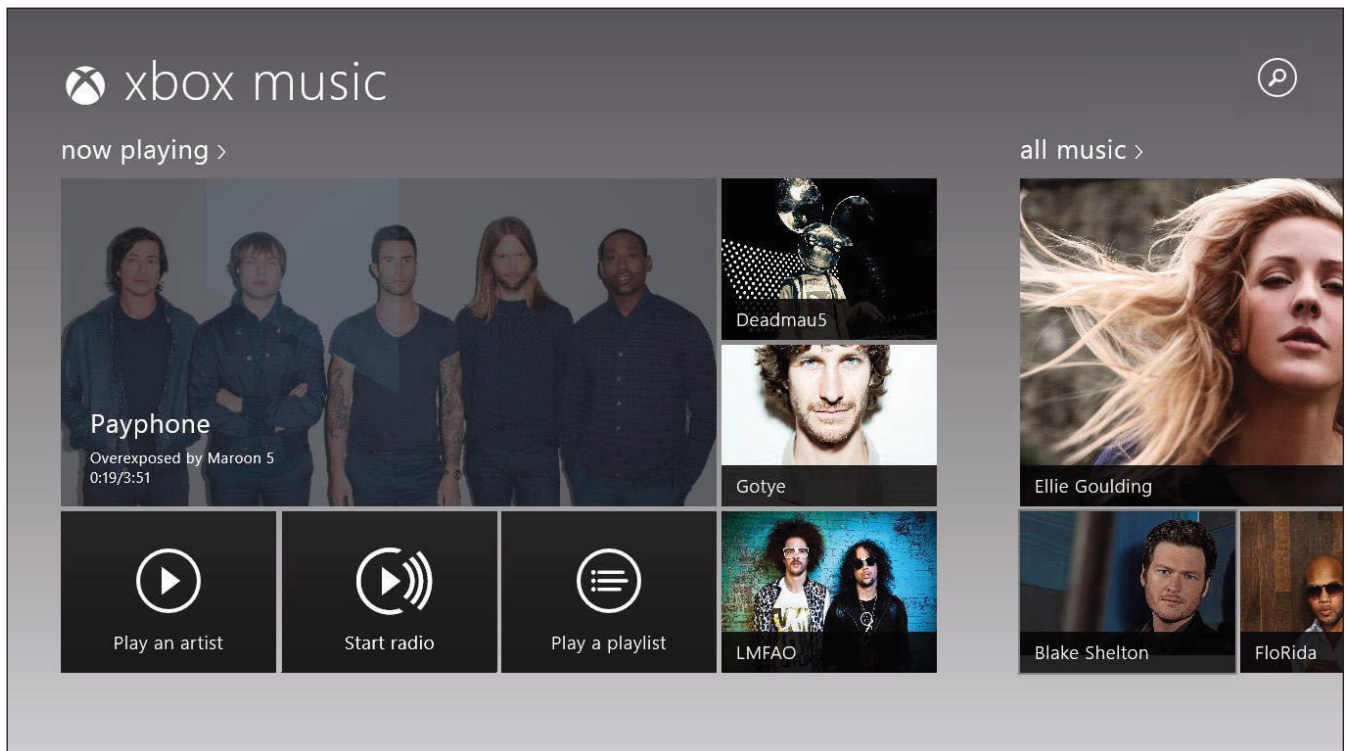
Version 8.50 Beta 4 is primarily a bugfix release, according to the developer. New features include a new font for the main window, plus the ability for the user to set the location

of Total Commander's background transfer manager.

OS support for the 64-bit version includes Win8/7/Vista/XP, plus "the corresponding server versions." There's also a 32-bit edition that supports even older OSes. ■

Music By Microsoft

How The Updated Xbox Music Service Stacks Up



Xbox Music is built into Windows 8. Microsoft says we can expect that the Windows 8.1 update will pack even more features into the Xbox Music service.

The Xbox Music service isn't exactly new, but until recently the vast library of 30 million tracks was only available to those with Windows 8 PCs and tablets, an Xbox, or a Windows Phone. Now, Xbox Music is available via iOS, Android, and most any Web browser, so you'll be able to listen to Xbox Music from most any device with an Internet connection. Xbox Music provides on-demand tracks that make it good competition for music streaming services like Spotify and Last.fm, as well as a Smart DJ utility that creates automatic mixes based on similar artists to compete with services like Pandora. With its new

offerings, how does Xbox Music stack up against the competition?

What Xbox Music Offers

Xbox Music started out its life as Zune Music Pass, where you could stream music from the Zune marketplace and download up to 10 tracks per month (for \$9.99 a month). Microsoft has upgraded the Xbox Music subscription so that you'll have unlimited downloads (from the Xbox Music Store) that you can listen to as long as you have an Xbox Music Pass subscription. And you'll still enjoy unlimited streaming. Lewis Ward, IDC

Research Manager, Gaming, says that with the changes, "I think Xbox Music has moved from being largely irrelevant to being a 'me too' music streaming service."

The Xbox Music Pass subscription can cost you either \$9.99 a month or \$99.99 per year. As of press time, Microsoft was offering a 30-day trial where you can test out the subscription service and cancel at any time. Like most online music streaming services, Microsoft offers both free and subscription streaming options. But the free web streaming service is only accessible via a Windows 8 system (through the Music tile) or the web client (www.xbox.com/music).

That's because Xbox Music Pass is required to stream music with iOS and Android apps. Don't think that you can trick Xbox Music by loading the web client into your mobile device either, as Xbox Music won't run on a mobile web browser (it requires Internet Explorer 8 or above, Mozilla Firefox 18 or above, Google Chrome 24 or above, or Apple Safari 5.1 or above).

If you own a mix of Windows, Apple, and Android devices, an Xbox Music Pass subscription is pretty much required to sync all of the songs, albums, and playlists you create across any PC, tablet, or smartphone you own. You can login/sign up for free using your Microsoft account, which is the login you may already have set up for use on an Xbox, Windows Live/Outlook services, or a legacy Hotmail account. The free version has some ads that occasionally play between tracks, but in our testing, we didn't hear them that often—maybe once every 10 minutes. For the first six months after you sign up, you'll enjoy unlimited streaming and skips, after which you'll be limited to 10 hours per month. The six-month unlimited playback feature is a smart move by Microsoft, as it gives people time to create playlists and music collections of their favorite artists. A free account can't download tracks or albums either.

With over 30 million songs, it's a given that you have a pretty large library

The six-month unlimited playback feature is a smart move by Microsoft, as it gives people time to create playlists and music collections of their favorite artists.

of music to choose from. The playlist building experience primarily consists of searching for artists and adding the albums and songs you want. Depending on how you're accessing Xbox Music (not available on the web client or Android clients), you may be able to select the Start Radio option, which will build a playlist of songs and artists like the one you selected. You can add individual songs playing on the radio to your playlists. If you're using Xbox Music on a Windows 8 PC, you'll be able to select from four screens: My Music (the songs stored on your computer); Now Playing (the current track); All Music (a tile that suggests music you may like); and Top

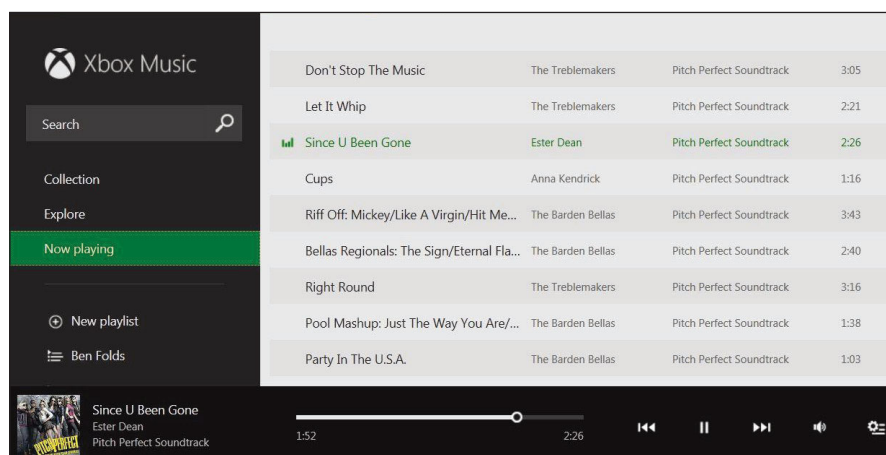
Music (the most popular tracks currently on Xbox Music).

The Windows 8 system and iPhone we tested on didn't provide any search categories for genre, but we found that you can enter a search term, like Musicals or Country, to bring up popular artists in a given music category. Unlike many of the other music streaming services we have looked at, there aren't a lot of different premade song collections, like a workout or dance, that can give you a quick mix when you're looking to fit music with your mood. And while the music on demand feature works well, the interface seems sparse.

What's Coming With Windows 8.1

Microsoft has announced that Xbox Music will be more integrated with the Windows 8.1 update. For example, there will be a search bar in the Xbox Music app that will make it easier to find specific songs, artists, and albums. Microsoft also has demoed a Bing search function that will list tracks within the search results, and if you select the song, it will begin playing the Xbox Music app. The Xbox blog indicates that "By collaborating with the Windows and Bing teams, Xbox Music on Windows 8.1 will make it easier than ever to find tons of great info about your favorite artists and instantly listen to the music you love without backing in and out of apps."

Another promised feature is improved collection management, where both the

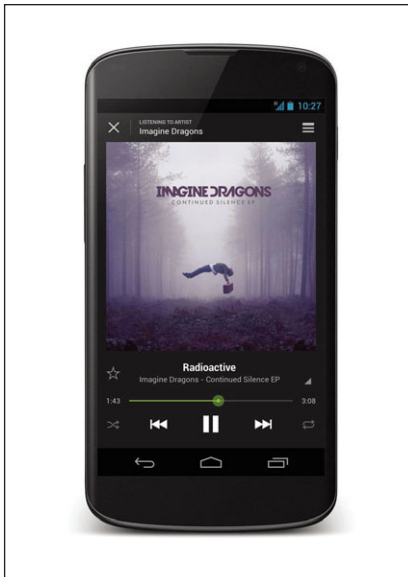


The Xbox Music web client allows you to stream content for free for up to 10 hours per month on a PC or Mac.

cloud music and locally stored songs you've added to the Collection section will appear on the app's splash screen. For faster access to the Radio feature, new streaming radio stations will appear based on the artists you like, as well as the Radio stations that you've already set up. The custom lists of playlists that you've configured will be available at a glance, and you can quickly play back and edit those lists. The Xbox blog says the redesigned Xbox Music app in the Windows 8.1 beta is "just a preview of what's to come," so you can expect to see other new features added at some point.

Spotify

If there's a service that Xbox Music is trying to emulate, Spotify seems to be the best fit, as its Premium subscription (\$9.99 a month) allows you to stream to all kind of devices (including some A/V receivers and set-top boxes), download tracks, and locate content on demand. One of the big bonuses with the Premium subscription is that you can download songs to your tablet or smartphone, ideal for those that want to avoid data charges. Spotify also offers an Unlimited plan where you can stream music on your PC without



Spotify Premium allows you to listen to the service on mobile devices.

ads. A free service is available to stream the on-demand tracks on a desktop or laptop.

A key differentiator for many Spotify users is the tools it has to let you quickly find the music you want to listen to. For example, there's a Discover tab on the

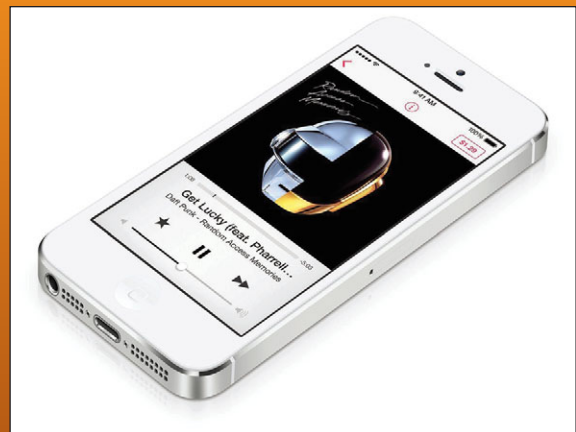
iOS and Android apps that gives you recommendations for other songs, based on the music currently in your playlists. Spotify Radio is the feature that will populate a complete music station based on an individual song, album, or artist that you select. Earlier this year, Spotify released a Browse feature that shows you a collection of playlists that Spotify has selected to match moods, situations, and environments. It also lists all the public Spotify playlists that users have made available. In this way, Spotify provides a feature that's similar to the online streaming service Songza.

Spotify lets you play locally stored files through its PC application, and because multiple file formats are supported, it can serve as a one-stop-shop for all of your digital music. Spotify also allows you to create playlists that are a mix of your local and cloud songs. There's a strong social component with Spotify, as you can share links and playlists with social network friends. In particular, Spotify works well with Facebook, as Facebook's Music section will list what Spotify content your friends are listening to.

iTunes Radio

Apple recently announced the iTunes Radio streaming service, and it functions similarly to Pandora in that it builds a radio station for you based on an artist, song, or genre. A radio station can also be created based around a song that's currently in your iPhone's library. Apple says the service has "more than 250 DJ-curated and genre-focused stations" that are now available. Similar to Pandora, you can like or dislike a track to customize the music played on the station, and iTunes Radio will adjust the music selections to better suite your tastes. All of your stations are stored in iCloud, allowing Apple owners to sync playlists between iPhone, iPad, iPod, Mac, PC, and Apple TV devices.

If you invest in iTunes Match, you can listen to iTunes Radio ad-free. iTunes Match is Apple's service that allows you to store the music on your PC, including the tracks you've ripped from CD (up to 250,000), in your iCloud account. If you have an iPhone with Siri, you can just speak the name of the song you want it to play, and you can even say things like "play more like this" to hear similar tracks. You can share your favorite iTunes Radio playlists via Facebook, Twitter, email, text message, and AirDrop.



iTunes Radio comes with iOS 7. Image courtesy of Apple

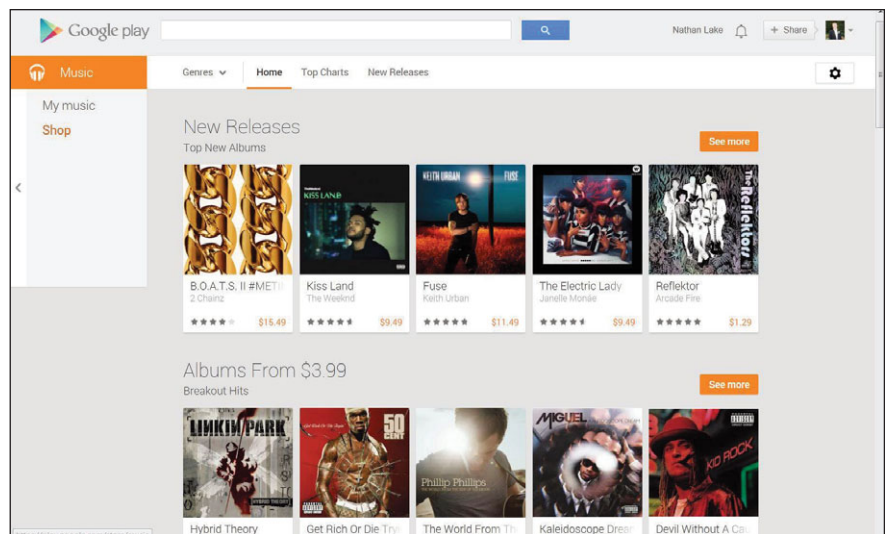
Spotify's music collection held about 20 million songs at last check, and the service uses the Ogg Vorbis format when streaming content. Spotify Premium account holders will enjoy content encoded at 320kbps quality when listening on a PC or mobile device. The high bitrate and library make it a good choice for audiophiles and music fans, and we like that Spotify Premium is available on a wide variety of devices. Currently, Spotify seems more fully developed than Xbox Music, but the updates coming with Windows 8.1 may create a more equal footing among the services.

Google Play Music All Access

Like Xbox Music and Spotify, Google Play Music All Access lets you search for and listen to music on demand, and the service works on both PCs and Android devices. The Google Play All Access library utilizes the tracks available on the Google Play music store, which boasts 18 million songs. You'll also be able to create a custom radio station (with unlimited skips)—all for \$9.99 a month. Google Play Music also offers a free component that allows you to save up to 20,000 of your own personal tracks to your Google account. Similar to Amazon Cloud Player, Google Play Music gives you streaming access to any of the music you've purchased from the Google Play store.

With a Google Play Music All Access subscription, you can play back both the cloud songs you've added to your playlists as well as tracks that you've uploaded. Like Xbox Music and Spotify, a Google Play Music All Access subscription will allow you to download songs for no additional cost for offline listening. You'll be able to listen to the music in offline mode as long as your Google Play Music All Access subscription is active.

Custom radio stations can be curated by genre, artist, song, and album, and we found that there was a wide variety of subdivided genres, such as '80s pop and '90s pop, so it's fairly easy to find a category that fits what you're looking to hear. Google provides you with custom-made playlists for each genre, like new releases and top songs. Google Play Music All Access lets you have unlimited skips on the radio stations, too, so



With Google Play Music, you can store up to 20,000 of your own tracks on the cloud.

you won't have to bother listening to songs that don't fit your tastes.

Those looking for a social component will like that you can share a free play of songs and albums (for content you've purchased from the Google Play store) with your friends on Google+. The interface even offers a Shared With Me playlist to let you review the songs that friends have recommended for you. All-in-all, this service is a pretty similar offering to Spotify, except that the social aspects work with Google+ rather than Facebook. A key difference for iPhone and iPad owners is that Google currently lacks an iOS app for Google Play Music All Access.

Amazon Cloud Player

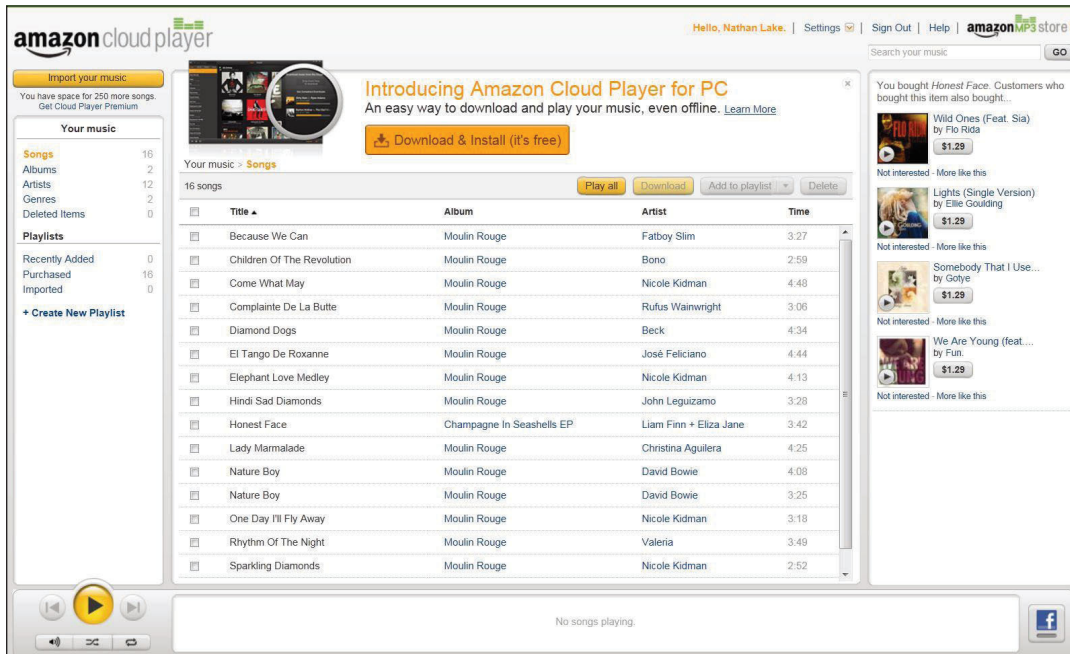
Last month in *CPU*, we examined all the new Amazon shopping venues, and Amazon has long been a popular service for music downloads. Amazon Cloud Player is an app for iOS, Android, PC, and Kindle Fire that lets you play all of the tracks you've downloaded from Amazon. You can also import other music you've purchased—whether you've downloaded it from another place or ripped it from CD—and listen to it on Amazon Cloud Player. We'll note that while the first 250 imported tracks are free, you'll need to pay for Amazon Cloud Premium (\$24.99 per year) to upload more tracks. Overall, Amazon lets you import up to 250,000 songs.

Other than the songs you've purchased or uploaded, there's no other form of on-demand music playback, nor does Amazon Cloud Player offer a radio station mix. That being said, the \$24.99 cost for a year is less than you'll pay for a year with services like Xbox Music and Spotify. And if you have a large personal music collection, especially songs downloaded from Amazon, Cloud Player is a convenient way to listen to your collection without having to physically store the files on your portable devices. Amazon Cloud Player is also available on Roku and Sonos devices as well as Samsung's Smart TVs.

Pandora

Compared to some of the other music streaming services, this Internet radio station is part of the old guard. Pandora's personalized radio stations are created based on particular artists and songs that you prefer. The station's suggestions are based on the Music Genome Project that analyzes each track for up to 450 musical characteristics. And you can further personalize the station by clicking a Thumbs Up or Thumbs Down button for each song. Songs that get the Thumbs Down won't be played again. There are no on-demand streaming capabilities, nor can you download songs to listen to offline.

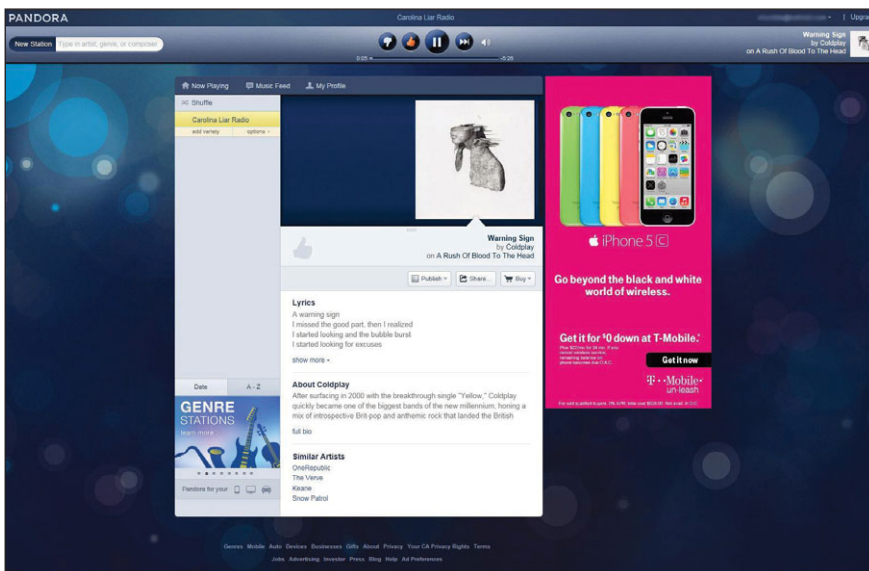
Pandora is free, but an upgrade to Pandora One (\$3.99 per month or \$36 per year) has



The Amazon Cloud Player will play any of the music you've purchased from Amazon.

numerous advantages. First off, you won't have to listen to any advertising. Second, Pandora will up your audio quality to 192kbps. Additionally, you'll be able to skip more songs per day, though you'll still be limited to six skips per hour, per station. The features of Pandora are pretty simple,

but it's a way to listen to music for free. Additionally, Pandora access is built into a ton of devices. We're talking set-top boxes (Direct TV, DISH, Verizon FIOS); Blu-ray players (Panasonic, Samsung, Sony, Toshiba); smart HDTVs (JVC, Panasonic, Sony, Toshiba); and a host of table-top speakers,



Pandora customizes your playback based on a given artist or song.

A/V systems, and digital media players. And of course, you'll find apps for Android, BlackBerry, iOS, Windows Phone, Nook, and Kindle Fire devices. The near-universal capability of the service makes Pandora a compelling choice.

Thoughts On Streams

The music streaming stations we covered here are only a few of the services available, so there's a lot of competition for Xbox Music. As it stands before the release of Windows 8.1, Microsoft's service seems to lack some

of the features of the similarly priced Spotify and Google Music All Access services. That's likely to change, as Ward says "Microsoft wants to be a full-on multimedia content distribution company. They have a beachhead with Xbox 360 games, and with the launch of Xbox One, they're going to try to build on the success of the Xbox 360's Xbox Live digital infrastructure in a number of ways."

Ward also says that Microsoft wants to "compete with Apple in music and offer movies and so forth. It remains to be seen whether they can really make much headway in music . . . Xbox Music is an attempt to make another run at challenging iTunes." Apple and Amazon's services provide legitimate competition, because those who have purchased their music through iTunes or Amazon can stream the tracks for a comparatively low price. And Pandora's integration into electronics around the household and portable devices makes it an affordable alternative. As such, over time Microsoft may need to add even more features to attract people to the Xbox Music service. ■



Thermaltake Tt eSPORTS Level 10 M: Headset & Shoulders Above The Rest

BY ANDREW LEIBMAN

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We've reviewed enough headsets to know a thing or two about what separates the good ones from the mediocre. Noise-canceling microphone technology and a wide and lush frequency response are compulsory, and when you're looking for big sound, nothing beats big drivers. But the best headphones are the ones that know more than one trick; that make you want to use them for more than just playing games. We've encountered ear duds that tick every item on the checklist but feel like a vice on your skull. It's not hard to look impressive, but the aesthetics are wasted if they weigh so much that you risk vertebral compression fractures during extended gaming sessions. Comfort, visual appeal, quality audio reproduction, versatility, and a competent design; all of these factor into making a good headset, and the Level 10 M gaming headset hits the nail on the head in every category.

Like the cases and mouse that also bear the name, Tt eSPORTS and BMW Group DesignworksUSA collaborated on the design of the Level 10 M. If you were a fan of those items, and we count ourselves in that group, then you'll immediately recognize some of the signature traits on this headset. We got our hands on the Diamond Black edition, but Thermaltake also offers the headset in Iron White. Aside from the mostly black finish, strips of red plastic accent the cans, the in-line volume

control module, and the USB and 3.5mm plugs. The can housing was designed with a layered effect to resemble sound waves. The adjustable headband shares this layered effect in the arrangement of its bent pieces of black and silver aluminum. One of the headset's more unique features is the headband locking mechanism, which lets you select and secure your desired headband size by pulling down red tabs on each side. There's a large red mesh-covered pad on the headband's underside and the cans each feature an oblong black pleather-covered cushion. The cans each rotate and tilt a few degrees to make sure they fit against your head comfortably. The Thermaltake dragon logo is on chromed discs on each can and also on the in-line volume control module. You'll also find the honeycomb design on the cans and volume control module. The plastic components on this headset are almost exclusively black and feature a rubberized texture.

The mic boom follows the contour of the left can and folds against it when not in use. You can also move the mic boom further from or closer to your face when it's extended. Thermaltake used durable, attractive black and red braided cabling throughout the headset and provided a compact USB port under each can, letting you choose which side you want to connect the main cable to. Thermaltake also bundled a cable that lacks the in-line volume control module, which you can connect to a mobile device that doesn't require volume or mute controls.



Quality in-line controls provide convenient access to mute and volume functions, and there's even a spare cable without the in-line module for when you want to use the Level 10 M with mobile devices.

There's a lot this headset does right, including the aesthetics and functionality, but the real tests lie in how it performs during games, movies, and music. To really put these headphones through the ringer,



If a black and red gaming headset is too conventional for your tastes, you'll be happy to hear that the Level 10 M also comes in Iron White.

we played some Left 4 Dead 2, CS:GO, and TrackMania 2 Canyon; watched a movie; caught up on a few of our favorite shows; and listened to a variety of music.

In the gaming sessions, the sounds of gunfire, undead moaning, rearview rivals, and fellow teammates in dire straits all came across in crisp detail. The roar of engines all had sufficient punch, and the ambient sounds of the virtual environments were all present and accounted for, helping immerse us in the game worlds even further. The Level 10 M's mic performed well when communicating with others, and the boom was easily folded out of the way as we settled in for a single-player experience.

A lot of gaming headsets are also tuned for bass-heavy soundtracks and sound great when you're driving a tank, listening to dubstep, or slamming your virtual fists against virtual faces, but those headsets fail to accurately reproduce the more nuanced soundtracks and dialog in movies and any music not designed to shred speaker cones. You can always add bass using a software equalizer, but it's virtually impossible to remove it. The Thermaltake Level 10 M, however, does not overdo the bass, which makes them just as ideal for watching movies and TV and listening to a wide variety of music.

We submit that what makes Thermaltake's Level 10 M such a great headset is that, while specced-to-impress, it is extremely comfortable to wear for hours on end, it looks amazing, and it reproduces full frequency range audio that makes it suitable for listening to music, watching movies, and of course, gaming. ■

Specs: Drivers: 40mm neodymium magnets, 10Hz to 22kHz; Mic: 300Hz to 10 kHz; In-line controller: Yes; Connector: Analog 3.5mm plug

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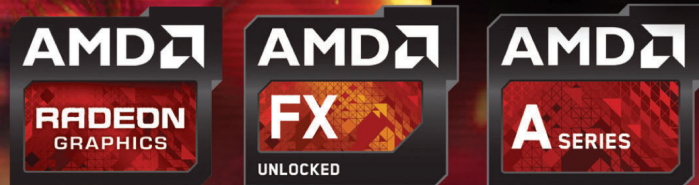
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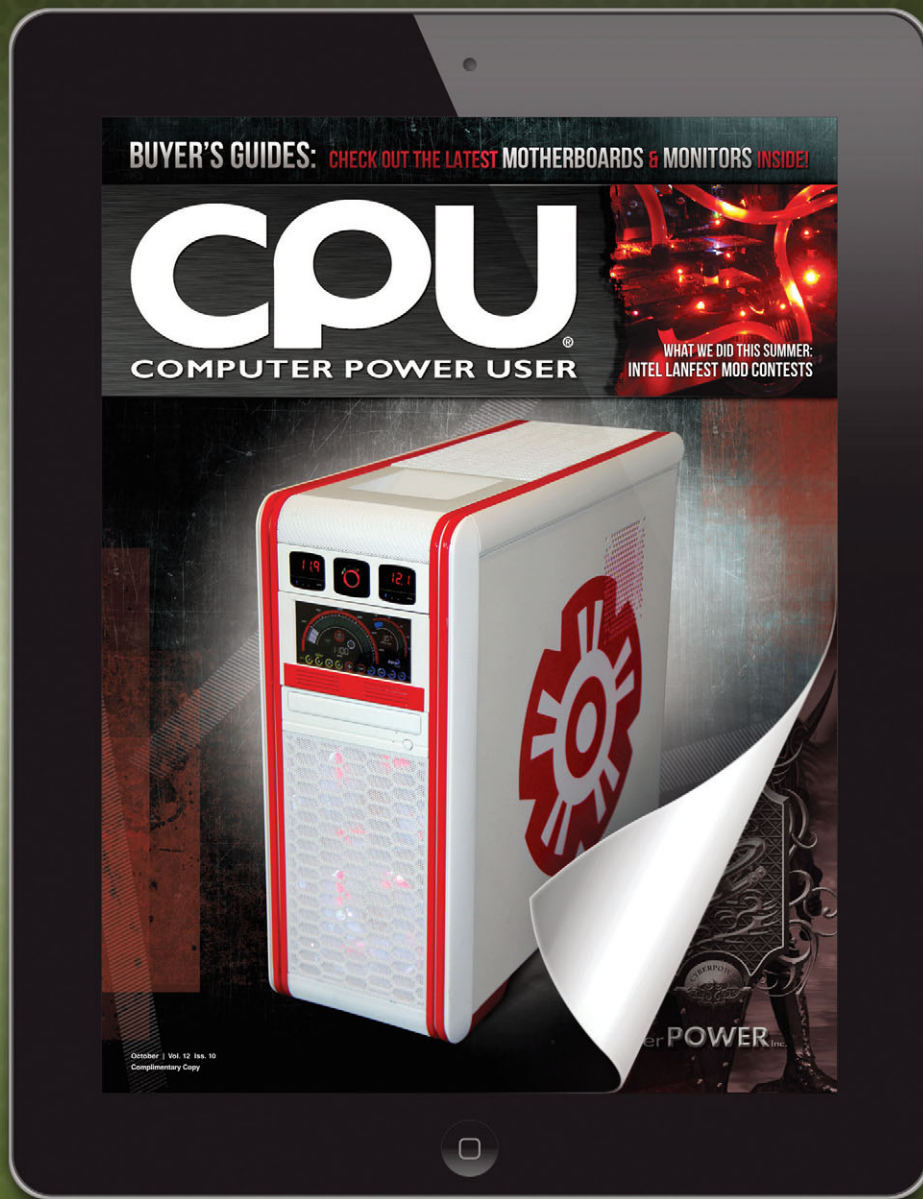
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Q&A With Tom Lin

ADATA's Managing Director, USA, On Memory & SSDs

Q What can you tell us about ADATA? How would you describe the company to readers who might not be familiar with it?

TL ADATA is developing in the U.S. market, but ADATA is indeed a very well-established company that is publicly traded on the Taiwan Stock Exchange platform. ADATA is a leading memory module manufacturer, specializing in modules that can easily be overlocked in gaming and personal computers. Aside from memory modules, ADATA also designs and manufactures solid-state drives, USB flash drives, and external hard drives to complement the line.

Q Memory is clearly the foundation of everything ADATA does, so we'll start there. In a crowded market full of choices and marketing hype, what sets ADATA DRAM apart? More specifically, what makes ADATA's XPG memory a good choice for system builders and gamers?

TL ADATA's XPG memory products go through stringent tests before they are available for purchase in the market. This means that every IC is independently tested, then tested again as part of a whole module. These tests are followed by a high-temperature endurance test and a speed test, among other tests. The product is then tested again to ensure consistency with our expectations for the XPG memory line.

Q What should readers know about your XPG V2 Series memory?

TL ADATA engineers and designers have taken modern games and technology and meshed them together to create a great-looking heatsink for the XPG V2 series. So the module not only serves the purpose of dispersing the heat from the memory ICs, it also looks great in your beautifully designed computer case. These modules go through the same stringent tests as our other memory lines, so they are up to any workload you throw at them.

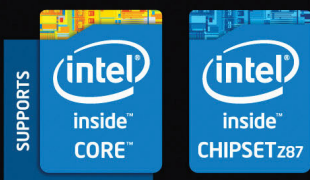
Q We've been using DDR3 in our PCs now for nearly seven years. How long do you think it will be until we see DDR4 in the market, and what are ADATA's plans where the next spec is concerned?

TL DDR3 is popular and the standard for most household and gaming computers. However, DDR4 has many benefits, such as low power consumption, faster clock speeds, and higher stability. ADATA DDR4 is under testing and validation with major motherboard makers and is poised to debut to the general public by Q2 of 2014, the same time as Intel's chipset that supports DDR4. ADATA showcased its DDR4 at the 2013 IDF in San Francisco, and we'll also be showing it at CES 2014.



Q What should we expect to see in the coming year from ADATA in the SSD market?

TL SSDs are becoming more common in our everyday life and are found in products ranging from smartphones to laptops, and even billboards and point-of-sale machines. ADATA has a product solution for every segment that needs this technology, including micro SSD, eMMC [embedded MultiMediaCard], DOM [disk on module], and enterprise SSD, as well as consumer SSD. ADATA has been testing SSDs up to 2TB in size, and that is a technology breakthrough that is worth getting excited about! ■



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